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LEGAL PROBLEMS OF COAL MINE RECLAMATION

A Study in Maryland, Ohio, Pennsylvania and West Virginia

by

THE UNIVERSITY OF MARYLAND SCHOOL OF LAW

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for

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Coal mining produces a variety of environmental problems -- acid drainage, sedimentation, surface subsidence and surface scars. This study reviews the response of legal institutions to these problems in Maryland, Ohio, Pennsylvania and West Virginia. Technological and economic concerns are also taken into account.

The study discusses the antecedents of today's Appalachian coal industry and the environmental problems it has created. It examines the way in which the property system allocates rights in coal and coal lands, the efficacy of litigation and present laws and regulations for preventing environmental damage, and constitutional limitations on the ability of states to effectively respond to the problems. A case study of the economics of the Maryland coal industry is also presented. Model legislation giving the states the necessary powers to respond to environmental problems, is proposed. The statute meets the mandate of section 14(c)(2) of the Water Quality Improvement Act of 1970 which provides as a prerequisite to federal participation in reclamation projects "that the state or interstate agency shall provide legal and practical protection to the project area to insure against any activities which will cause future acid or mine water pollution."

This report was submitted in fulfillment of Grant No. 14010 FZU from the Environmental Protection Agency to the University of Maryland.

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CONCLUSIONS

1. Coal mining can produce a variety of harmful environmental side effects. Among these are stream degradation by acid drainage and sedimentation, landslides, erosion, surface scars, subsidence and fires. The existence and gravity of these harms depends on such factors as the type of mining done, the nature of the surrounding strata, topography and climate. Unlike most industrial side effects, mining's diseconomies continue after the operation terminates unless adequate abatement or reclamation measures are performed. Due to insufficient legal controls, such measures have not been performed in most operations in the past, and a significant portion of today's mining diseconomies originates in inactive mines.

2. Minimization of side effects both during and after the mining operation is greatest when pre-planned and built into the mining operation. Even then, alleviation of some side effects requires post-operation activity such as treatment or maintenance of abatement installations. In some situations, where one or more side effects can not be prevented, prohibition of the mining operation is the only suitable remedy.

3. Although the owner of land presumptively owns the minerals within, ownership may be severed so that the surface and the minerals belong to different persons. The owner of minerals, whether or not he is the surface owner, may extract them himself or he may give the right to extract them to someone else, usually by means of a lease. The practice of severing ownership was greater in the past than it is today. However, severances have produced a significant amount of split ownership.

4. Separate ownership of surface and minerals has complicated procurement of requisite assent to perform reclamation activities. Both severed ownership and the practice of leasing operating rights have complicated allocation of responsibility for coal mine side effects. In the past, neither the surface owner where ownership

was split nor the lessor of the mineral rights were generally held responsible for the environmental damage resulting from the mining operation.

5. Private litigation does not afford an effective vehicle through which coal operators can be made to internalize the costs of coal mine diseconomies occasioned by their operations.

6. All four states have adopted legislation enabling the creation of water quality standards and prohibiting discharges in violation of those standards. The legislation or the regulations thereunder limit acid drainage discharges. The application of these rules to inactive mines has been uncertain. All four states have statutory provisions requiring some form of mine sealing. Except in Pennsylvania, however, these provisions are directed more at diminishing safety hazards than at drainage.

7. All four states have adopted legislation regulating surface mining. This legislation is generally marked by requirements of a license or permit to mine, filing of a bond or security deposit, prescribed reclamation standards, liability for revocation of the permit if reclamation requirements are not performed and creation of a fund made up of fees or per-acre contributions by mine operators which has the purpose of financing reclamation of unreclaimed stripped lands. Aside from the fund last mentioned, surface mining legislation generally does not reach reclamation of inactive surface mines. Except for a limited prohibition in West Virginia, no state prohibits strip mining outright, although prohibition may come about through the refusal of a license where grave side effects can not be prevented.

8. In Pennsylvania and Maryland, bonds have been authorized to finance state reclamation activities on inactive mines.

9. It sometimes is necessary to distinguish active from abandoned mines for regulatory purposes. The definition of "abandonment" developed by the cases in other contexts is often inadequate to meet the needs

of effective environmental regulation.

10. In most instances the states may limit the discharge of acid drainage from coal operations, without compensating the coal operator.

11. If application of a ban on surface mining prevents a coal operator from receiving a fair return on his investment compensation is constitutionally mandated.

12. The states may constitutionally impose the cost of remedying past environmental degradations resulting from coal mining on the present generation of miners.

13. In Maryland and perhaps West Virginia, state constitutional amendments would seem prerequisite to abatement or reclamation programs involving acquisition of land by the state and its subsequent transfer back to the private sector, following restoration.

14. The four states have a variety of constitutionally imposed strictures on the ability of the states to borrow money which interfere with the public financing of abatement and reclamation projects.

15. In Maryland imposition of the costs of pollution abatement and reclamation on mining operators would not result in substantial curtailment of coal production.

RECOMMENDATIONS

1. Authority to regulate coal mine side effects should be exercised by a single state agency. This agency should be headed by a single executive official and be placed within the state's major natural resource department (e.g. Department of Natural Resources, Department of Environmental Affairs, etc.).

2. The Agency should have rule-making authority to establish "background" quality standards in mined areas; these background standards would create parameters which limit adverse environmental impacts on air and water quality, preclude excessive noise and subsidence, and require surface restoration.

3. The agency should have rule-making power to prohibit mine operations which under the present state of technology are not subject to effective reclamation or which present a public health or safety hazard.

4. Mine operators should be required to get approval from the agency prior to engagement in mining operations. Such a permit system would shift the burden of establishing that a mining operation will not have adverse environmental effects to the applicants and provide a vehicle through which responsibility for degradations can be fixed. Rights granted to a mine operator pursuant to a permit should be subject to suspension or revocation by the agency for violations of the permit's terms. A bond or security deposit should be required in an amount sufficient to defray the cost of completing reclamation should the operator fail to do so.

5. A severance tax on the taking of coal should be established. The rate should be fixed so that the proceeds from the tax will create a fund which when added to forfeited bonds and security deposits will be sufficient to pay the capital and operating costs of controlling mine side effects.

6. The agency should be empowered to directly engage in projects and to acquire, construct and operate facilities which deal with coal mine side effects.

Projects would include an inventory of mining operations and facilities would include mine acid treatment plants. An expedited condemnation power should accompany the powers given the agency.

7. The costs of remedying past adverse environmental side effects resulting from mining operations which were lawful when undertaken should be paid from general revenues. The cost of remedying future environmental degradations to the extent possible should be charged to the responsible mine operation; if there is no responsible mine operator such cost should be charged to the mining industry generally.

INTRODUCTION

This study deals with the environmental problems occasioned by coal mining. It is the product of a fifteen-month inquiry into the legal steps which may be taken at the state level to remedy and prevent environmental degradations. It is titled Legal Problems of Coal Mine Reclamation: A Study in Maryland, Ohio, Pennsylvania, and West Virginia.

Coal mining produces a variety of environmental degradations -- acid drainage, sedimentation, surface subsidence and surface scars. These side effects are a product of the technology of the taking and the economics of the alternatives. But law is the vehicle through which technology can be constrained, and through which a shift in taking procedures may be mandated. The study, therefore, intermeshes its legal analysis with technical and economic considerations.

The term reclamation in the subtitle is used generically to embrace the full range of possible responses to environmentally degrading side effects resulting from mining. Hence it includes not only surface regrading and revegetation but also procedures for sealing or treating acid mine drainage. However, not all the environmental problems associated with coal are closely reviewed. Burning of coal with a high sulphur content presents a significant air pollution hazard. Likewise, mining operations pose health and safety hazards to coal miners. Since this study is primarily concerned with the physical environmental problems resulting from coal mining, these problems are only tangentially discussed.

The four subject states, Maryland, Ohio, Pennsylvania and West Virginia, are not the only areas with coal mines which produce environmental problems in the Appalachian region. Kentucky, in particular, has been and continues to be extensively mined. But the four subject states do have a common denominator -- they constitute the region in which the American coal industry began, and contain that combination of inactive and active deep mines and strip mines which is particularly productive of all the side effects considered.

The study is divided into eight chapters. Chapter One, A History of Appalachian Coal Mines, traces the social and economic antecedents of today's coal industry. Chapter Two, Side Effects of Coal Mining, details the causes of environmental degradations from coal mining and the procedures for reclamation. Chapter Three, Coal Rights and the Property System, describes the legal calculus which allocates property rights in coal and coal lands. Chapter Four, Common Law Responses to Coal Mine Side Effects and Chapter Five, Statutory Responses to Coal Mine Side Effects, review the efficacy of litigation and regulation as devices for forcing coal operations to internalize the environmental damages occasioned by their operations. Chapter Six, Constitutional Limitations on State Action, investigates the extent to which state or U.S. constitutional provisions limit the ability of the states to deal effectively with side effects. Chapter Seven, Coal Mining in Maryland: An Economic Case Study, presents a methodology which may be used to improve decision-making. Chapter Eight contains a model state statute designed to give state administrators the requisite reclamation powers. This legislation meets the mandate of Section 14 (c)(2) of the Water Quality Improvement Act of 1970 which provides as a prerequisite to federal participation in a reclamation project: "that the state or interstate agency shall provide legal and practical protection to the project area to insure against any activities which will cause future acid or mine water pollution."

I

A HISTORY OF APPALACHIAN COAL MINES

Man has always required heat, synonymous with life and energy, and worshipped light. He learned to capture both in fire, and with that discovery came a new mastery over the quality of his environment.

Primitive people burned the obvious and easily attainable things -- dried leaves, grass, peat, wood -- before they found that by banking a wood fire the gases could be burned off, leaving charcoal, which in turn yielded a more intense and evenly dissipated heat. It is probably this kind of fuel to which reference is made in the Bible (Proverbs XXXVI): "As coal is to burning coal, and wood to fire so is a contentious man to kindle strife." By the Tenth Century B.C., when this passage could have been written, bituminous coal remained undiscovered.[1]

One hundred and fifty million years ago vast ridges and low depressions folded and formed near what are now the Appalachian Mountains, and ages later swamp forests developed in the valleys, bearing and shedding spores and thick leaves. Rock formations beneath the forests sank and rose in cycles, taking their carboniferous tenants to a silty grave many feet beneath the surface. New forests crept back centuries later, growing atop the fossilized predecessors, rocks rising again and trees once more shedding their leaves.

This ineluctable pattern continued until about seventy million years ago, at which time a great geographical revolution convulsed most of northeastern America. Large masses of surface land, twisted by enormous pressure and heat, were finally thrust up into the Appalachian mountains. By that time all the coal in northeastern America, from the softest bituminous to the hardest anthracite, had been formed and deposited.

Meanwhile on other parts of the earth -- in Europe, Asia and China -- dense carboniferous forests continued to grow for another fifty million years, as they did in western American coal fields until another physiographic trauma raised up the Rockies and the Andes. This happened twenty million years ago, the point at which all the coal we possess had been packed away into the ribs of the earth. That which had undergone relatively little stress became bituminous or "soft" coal; that which withstood great heat and pressure became anthracite, a harder and ultimately superior substance. The biggest and richest deposits of anthracite lay in northeastern America, principally in the area that is now Pennsylvania.[2]

The early civilizations probably used some of the coal beneath their feet (even in the Tenth Century B.C., the world's mountains had vast mineral cores), but the first records of "black rocks" were made by the Romans: Theophrastus wrote about "rock coal" (as opposed to charcoal). At a corresponding time, the English were mining coal -- bituminous cinders and crude mining implements have been found with the remains of early Britons. In 852 A.D. the Abbot of Peterboro wrote a receipt for twelve cartloads of coal, and in 1180 the Bishop of Durham offered a brief description of mining techniques. Other civilizations had used coal for ornamentation, but the English were the first people known to use it for heat.[3]

By 1250 A.D., wood was getting scarce in England and its price was inflating rapidly. London began to import coal from surrounding towns. Despite the high cost of wood and the general availability of coal, in 1306 the English Parliament decided that burning coal was harmful to health, and called for its prohibition. At least one luckless Londoner was executed under the law.[4] As it turned out the wood lobby did not yield until the end of the 14th century.

For many years England produced most of Europe's coal. When the Commonwealth was extended into North America, the Mother Country also became the colonies' chief supplier, despite the rich coal fields upon which the new settlements were built. But the frontier economy was almost entirely agricultural, and there was little demand for coal until the mid-1700's. Whatever colonial industry did exist at this time found an abundance of wood fuel within easy access, and coal from England was used primarily in Philadelphia, then the leading industrial city on the coast. The total quantity of coal used yearly in the colonies prior to the Revolution never exceeded 9000 tons.[5]

That the colonists did not use their own land's coal may be attributed in part to ignorance of its existence. For their part the Indians had thought coal to be little more than shiny black rocks. With the lone exception of the Hopis, in Arizona, who as early as 1000 A.D. used lignite for burning pottery, coal was never employed by the native American red man for anything more than making paint and ornaments.[6]

In 1700 America was still largely a forest-clad wilderness, and there was little to suggest the extent of the coal deposits which rested beneath it. The Indians and an occasional hunter clambered over the mountains and through the woods but no one dug very deeply, until some curious settlers took notice of certain black rocks with a peculiar glossiness to them.[7] The first reference to "stone coal" in America dates to 1669 -- found, as legend has it, by a Virginian hunter pulling up a small tree along the river bank. Not until 1745 was the first coal mine established.[8]

It is important to understand colonial terminology. In the Seventeenth Century "coal" meant charcoal -- the most commonly used fuel. In England, from the early part of the 13th century, bituminous coal was called "sea coal" because it fell into the ocean from the seams exposed in the overhanging cliffs. On this continent the term "stone coal" was used to differentiate it from charcoal. Alexander Hamilton mentioned "fossil-coal" in his reports and in 1781 Thomas Jefferson called the substance "mineral coal."[9] The word "mine," when used by early writers, had a different meaning; in the 1700's a mine was simply a deposit or outcropping of coal. When the actual extraction of coal began, it was from "pits" (today's mines).

The earliest official reference to coal in the United States is found in the accounts of Joliet's expedition to the Mississippi River in 1673. Seven years later LaSalle found coal near the Illinois River. In 1698, the discovery of the mineral in Pennsylvania was announced in a treatise by Gabriel Thomas. A 1736 map of the Potomac River noted the presence of coal in Maryland and West Virginia. Seams were not found in Ohio until 1750.[10]

By 1760 most of the colonies which had coal fields within their borders knew about them, but very little had been done to tap the vast underground wealth. The colonists had wood in great abundance, and Britain pressured them to import what little coal was used. Moreover, the areas where coal had been discovered were far outside the boundaries of eighteenth century civilization. Adventurous trappers and traders had an idea of the mineral's potential value but few settlers would risk going to get it. As early as 1736 one of the world's richest coal deposits, the Cumberland Field, was marked on a map of the north fork of the Potomac River -- but at that time not a single permanent settlement existed within a 100-mile radius. Finally, in 1754, a group of far-sighted Pennsylvanians began to exploit the resource lumped about their feet. They were the first colonists to do so. The early entrepreneurs formed the Susquehanna Company and bought from the Ten Indian Nations all the land in the Lackawanna and Wyoming Valleys of northwestern Pennsylvania. Perhaps even the buyers were not fully aware of the wealth they had purchased, and certainly it was a small sum for which the Ten Nations deeded to the colonists 484 square miles of rugged, mountainous country. Below ground extended four irregular canoe-shaped fields of anthracite, the largest and richest beds yet discovered in the world.[11]

The first actual production of coal in the Appalachians occurred in 1768, when the proprietors of Pennsylvania purchased from the Indians the area around Pittsburgh and began to lease parcels for coal developing. By 1776 coal was being used in the armory at Carlisle to help forge weapons for the Continental Army. In a broadside delivered by the citizens of Alexandria, Virginia and Georgetown, Maryland (dated December 7, 1789) attention was called to the advantages of their Potomac homeland as the site for the national capitol. They advertised that "slate, marble, free-stone, and iron ore may be had in great abundance...of coal, too, there is an inexhaustible quantity near Cumberland, convenient to water carrying."[12] Following the Revolution, the coal fields of Eastern Pennsylvania and their value to the new nation was likewise discussed by Tench Coxe (Secretary of Treasury, 1794) and soon the sites of rich seams became a primary criterion for locating new towns and cities.[13] While not extensive, there was continuous need of coal at places along the Potomac at least as early as 1798. The major user was the United States armory at Harper's Ferry, whose rifle works began operations with coal as the primary fuel.[14]

After the Revolution settlers began to move westward over the mountains, into the far reaches of Pennsylvania, Virginia and West Virginia. By the early 1800's they had reached down into Kentucky and pushed further into Ohio. With the growth in population and an increasing scarcity of wood on the eastern seaboard came greater reliance upon coal. By 1830 production west of the mountains surpassed that to the east.

The greater use of American coal (as opposed to the imported variety) began in the 1810's, spurred by an embargo on shipping due to the War of 1812. However, a number of problems were raised by the shift from foreign to native coal, the most serious being transportation. When importing, there had been little trouble getting to the major coastal cities, which at that time bought 90% of all the coal that entered the country. But when the east coast looked to the west for fuel, it found that adequate means for carrying coal out of the mountains and into east coast furnaces were virtually non-existent.

This was the first of a series of transportation difficulties that plagued the development of the coal lands. As is usually the case with heavy and cheap materials, the extent to which they can be profitably marketed depends upon the cost of transportation. At the beginning of the Nineteenth Century, the roads were poor and there were no mechanical means of haulage; in many states, particularly in Pennsylvania, most rivers remained unnavigable. The early producers could not move their coal more than a few miles from the mines.[15]

The need for more efficient methods of transportation to and from the western areas had been urged even by George Washington. The first turnpike over the Alleghenies, completed in 1818, reached to Wheeling, West Virginia. Because of the great weight of coal, however, the turnpike was of limited value to its shipment.[16] Profitable production awaited the introduction of improved means of transportation -- the development of the steam engine and a system of canals.

In the early 1800's, when the need for coal had become urgent, serious thought was given to western canals. The increasing population, the scarcity of wood fuel, the embargo, and perhaps most important the discovery that coal could be used in iron smelting, all served to put pressure on state legislators to connect east with west. In 1811 the first steamboat appeared on the Monongahela River and revolutionized navigation on Pennsylvania's rivers. Nine years later canal systems were built in Pennsylvania and Maryland.[17]

Around 1810 it was learned that coal -- if fired correctly -- could be used to smelt iron ore. Prior to this discovery only charcoal had been used; with supplies rapidly depleting, manufacturers needed an alternative fuel. Before the Nineteenth Century the various properties of coal had not been fully understood and the rock was used primarily for domestic purposes: home heating, brick-making, blacksmithing. With the proper firing formula came a period of rapid growth for the industry. The use of coal in iron production began as soon as the mineral was made available to the eastern manufacturing centers. By 1840 coal had become the exclusive fuel, fully replacing charcoal.[18]

But the increased use of coal came as a mixed blessing to the mining regions. In 1800 a visiting Englishman wrote of his approach to Pittsburgh:

> "We were struck with a peculiarity nowhere else to be observed in the states; a cloud of smoke hung over it in an exceedingly clear sky, recalling to me choking recollections of London. The

> clouds, I am told, come from
> the coal the townspeople burn."[19]

Indeed Pittsburgh soon came to be called the "Smoky City." In 1807 another traveler noted that "the first entry into Pittsburgh is not agreeable, as the sulphurous vapor rising from the burning of coal is immediately perceptible."[20] Probably one of the first anti-pollution devices to be commercially advertised was touted by the Pittsburgh Gazette in 1814. Addressed to "the inhabitants of Pittsburgh," the notice called attention to a device for "consuming the smoke of coal furnaces, etc., adaptable to any boiler or copper, at a very small price, without requiring more coal than usual."[21] Beginning in that year, editorials regularly condemned polluters -- perhaps to little avail, as conditions were to worsen for more than a century afterward.

In 1819 Pittsburgh suffered what is now known as an atmospheric inversion. The surrounding air became so dense that townspeople were forced to wear goggles, and one newspaper reported:

> "Our thick atmosphere...has been unusually gloomy for a few days...the cause is a large quantity of wood smoke, this added to the thick haze of an Indian Summer and our always heavy coal smoke has upset all our philosophy. Many wear goggles, the rest are generally in tears."[22]

Despite this unpleasantness, numerous coal towns sprang up through western and northeastern Pennsylvania, western Maryland, eastern West Virginia and eastern Ohio. In 1821 a West Virginia newspaper ran an advertisement for colliers:

> "From 10 to 20 steady and industrious men, who understand digging coal, may obtain high wages in Kenhewa for that business."[23]

A few days later the contractors announced they had received over 100 job applications. Tracts of land were opened by various other companies, and there was seldom any difficulty finding takers.

Whence these men who "understood coal digging" when coal was so new to the country? Most of them immigrated to the United States from Europe, particularly Wales where coal had been mined for more than a century. Others came from England, Ireland, and various parts of eastern Europe, hoping to make their fortunes teaching an upstart country how to use its new found resource. A good number of the early arrivals became wealthy. They had come just prior to the discovery that coal could smelt iron, and with relatively limited funds they purchased coal property. When demand suddenly increased and prices rose, the immigrants became charter members of a growing class of entrepreneurs.

The coal regions of Pennsylvania, Maryland, Virginia and West Virginia grew and prospered during the first half of the Nineteenth Century. In 1838 the Pennsylvania Legislature directed its Secretary of the Commonwealth to collect data on all of the state's resources -- the country's first official collection of coal statistics. The survey showed that in Pittsburgh alone the coal industry had contributed $565,200 to the city's economy. By 1839 coal had become a million-dollar business in both Pennsylvania and Maryland, and during the next three years West Virginia and Ohio could make similar claims.[24]

With the completion of the B. & O. Railroad to Cumberland in 1842 and the C.& O. Canal in 1850, Maryland coal could be transported from the west to the tidewater areas. The Free State's coal fields developed rapidly.

In 1822 the canal along the Schuylkill River in Pennsylvania had been finished. During its first year of operation 1500 tons of coal were hauled through; by 1841 the tonnage had grown to 6500. In that year, the railroad connecting Pennsylvania and Ohio coal fields with the east was completed, and canal traffic began to decline.[25]

The outbreak of hostilities between the states in 1861 greatly increased the demand for coal as both North and South sought to cut off one another's supply lines. By 1864 all mining activity had ceased in West Virginia -- not to be resumed again until 1867. During that lapse dams were washed out, the turnpike became overgrown, and heavy damage to the mines occurred. Operations of Maryland's B. & O. were likewise seriously hindered by military activities and the mining of coal severely curtailed. Within a year of the reopening of the lines in 1865, however, Maryland's production was greater than ever.[26]

Following the Civil War, as newer and heavier factory machines were developed, the nation's renewed demands for iron were reflected by manufacturers clamoring for coal, by now the prize fuel. But mining operations were becoming more difficult as supplies from surface fields were exhausted -- the coal companies were forced to go farther and farther underground.

In practically every field opened before 1840, coal was recovered by quarrying -- an operation done by hand, on a small scale, which amounted to simplified strip mining. New quarries were opened as soon as recovery became too difficult or expensive. When it became necessary to drill into hillsides, the coal was undercut by hand and taken out on sleds.[27] After the Civil War, however, with the surface veins of Pennsylvania and Maryland nearly depleted by North and South, the primitive quarrying methods proved inadequate to meet demands.

Two innovations changed the fortunes of the coal companies and the lives of their employees, as well as the surface of the land: underground mining and the widespread use of explosives. Perhaps even more consequential were the changes in mine ownership. The Civil War had given rise to large iron and steel companies, at that time the principal coal consumers. It did not take long for these early corporations to realize that if they owned and operated their mines they could greatly cut their costs. Iron and steel companies sent emissaries to purchase as many coal properties as were available, before news of their value leaked out. Seams opened and operated by the big corporations were known as "captive" mines, meaning all the coal produced was captured by the companies for their own use.[28]

The implications of the shift in ownership (from small, private companies to large corporations) were particularly important to the immigrants still flooding over the mountains. Prices were too high to buy the small bits of real estate left by the corporations, but so desperate were the inexperienced mining companies for the skills of professional miners that they often recruited in Europe and paid for the passages of experienced hands.[29] The immigrants still had advantages over those who would follow.

The price of coal rose steadily through the 1870's and 1880's. Mine owners had become wealthy and could afford to build attractive settlements for their employees. Most of the mining towns constructed in the 1870's were well laid out, consideration being given to planning for churches, schools, recreation facilities and meeting houses. The houses were coal-heated, of course, and built of sturdy wood. Except for occasional cave-ins and other disasters occasioned by the shift to underground recovery, the life of the miner in the years immediately following the Civil War was reasonably comfortable. He was usually well paid, his skill respected.

The relatively good working and living conditions did not prevent the miners from trying to organize, although early attempts at unionization were mostly unsuccessful. Prior to 1848 there were few concerted movements to unionize; that year, however, in Schuylkill County, Pennsylvania, the first United States miners union was formed. A secret organization created in 1859, called the Equal Justice Society dissolved after attempting an unsuccessful strike for higher wages. In 1861 the American Miner's Association was formed in Illinois. Two years later it had spread to Ohio and Pennsylvania, but the union folded in 1864 following internal confusion.

While scattered locals were started during the Civil War, no large-scale attempt was made to organize the coal fields until 1868. This movement was spearheaded by the Miner's and Laborer's Benevolent Association, which was founded in 1868 in Pennsylvania and soon spread to Maryland

and Ohio. In 1869 the M.L.B.A. called a long strike to support its demands for uniform wage standards. (At that time miners worked ten-hour days, six days a week, for from $15 to $18 weekly, a comparatively high salary for the era.) In 1873 the M.L.B.A. was absorbed by the National Association of Miners of Ohio. This union reached its zenith in 1875, then collapsed.[30]

In 1875, the biggest and most organized miner's union to that time was formed. Fostered by the Knights of Labor, it called itself the National Federation of Miners and Mine Laborers of the United States. Fights for higher wages did not begin until the 1890's; the Federation's initial grievances were directed against unscrupulous company stores and hazardous underground mine conditions.

Alongside of these publicly formed organizations grew many secret ones. Groups known as the "Buck Short," the "Sleepers," and the "Ribbonmen" were created before, during, and after the Civil War. The maverick fraternities were made up mostly of immigrants who had been excluded from formal unions; many of them were crude fighting men, not averse to violence. The most notorious of the clandestine organizations was the Molly Maguires, which began in the Pennsylvania anthracite fields in the late 1860's. Racial prejudice and anti-Catholic sentiment ran high through many of the mining towns; the Molly Maguires were frustrated Irish immigrants angered by discriminatory hiring practices.

The rise and fall of the "Mollies" occurred over a short span of years, but during its life the group attracted worldwide notoriety. The Molly Maguires regularly went on rampages of murder, riot and sabotage. Their activities were not brought to an end until the organization had been infiltrated by Pinkerton men and exposed. The summer and autumn of 1876 were filled with the trials and hangings of more than a score of Molly leaders.[31] Although incidents of violence have continued to scar the mining industry up to the present day, the decline of the Molly Maguires signaled an end to large-scale secret organizations of miners.

The later decades of the 1800's were characterized by a power struggle among the various large unions.

The contest for the miners' allegiance eventually narrowed to one between the Knights of Labor and the National Federation of Miners and Mine Laborers. Both groups fought continuously until January 23, 1890, on which date they joined in Columbus, Ohio to become the United Mine Workers of America.[32] The UMW continues to represent coal miners throughout the country.

The coal boom continued into the Twentieth Century. The "age of invention" had begun and each new creation boosted market demands, particularly from the automobile industry.

With the First World War massive amounts of supplies -- steel for munitions, food and clothing for the army, lumber for ships -- had to reach their nationwide destinations by rail. Coal supplied 70% of the energy to keep the locomotive wheels turning. Though eleven thousand mines were in operation by 1920 to supply the country's needs, prices continued to rise. The "War Brides" of the Appalachians were born, companies which flourished while war prices were high and closed when the prices went down.[33]

Coal markets continued to expand after the First World War, though their growth was slower and more irregular than before. Two new fuels, natural gas and petroleum, were now beginning to satisfy the call for fuel.

As consumers were turning to new sources of energy, labor disputes and sporadic strikes and violence made the supply of coal unsteady in the decades of the 20's and 30's. The Second World War again underscored the need for freight to move from coast to coast, so again new mines were opened and again the industry flourished. Coal heated millions of homes, powered huge locomotives, and fed burgeoning electrical plants. The industry hit its peak in 1947, when it produced 630 million tons of coal.[34]

By now, however, diesel-electric locomotives had come into use and natural gas and fuel oil had begun to assume preeminence as the nation's primary home heater. The industry looked for a new, less expensive way to retrieve coal from the earth. It found its answer in widespread strip mining.

Throughout the 'Fifties and the first half of the 'Sixties, the coal producers struggled to regain their wartime successes. A revival began in the late 1960's and continues today. By 1970 production was more than 600 million tons.[35] In 1970 renewed demands for coal, intensified by a fuel shortage and subsequent energy crisis, shot prices up from $6.00 to $13.00 per ton.[36] With natural gas in increasingly short supply and fuel oil becoming more difficult to obtain, and with steel production pinching supplies, mines which not so long ago were closing because of a coal glut are now digging in to meet seemingly endless demand.

Japan has quadrupled its steel output since 1965, and now imports up to 95 million tons of coal a year. Japanese steelmen are investing 500 million dollars to finance new mines in Canada, Australia, South Africa, the United States, India, Poland and Russia.[37] The United States has been Japan's largest supplier of coal, exporting 21 million tons in 1970, but the limited domestic supply is making it more lucrative for coal producers to keep their product at home. Electric power needs, moreover, are doubling every ten years. There is little likelihood of a voluntary slowdown in demand.

Only the disadvantages inherent in extracting coal from the earth, and the environmental pollution to which the fuel contributes afterwards, may serve to depress production figures.[38] Though new techniques are being developed to eliminate the high percentages of sulphur oxides given off by burning coal, serious mining problems remain.

The industry's pitch -- that the cheaper its product the better the nation's economy -- cannot be faulted by elementary logic. But it is difficult to overlook the environmental consequences of strip mining. Here is how one journalist describes the process:

> A herd of coughing machines
> crackle the once serene

mountain air. To reach the coal, the machines must first attack the trees. They quiver against the knives and give up with a shudder. Bulldozers push them aside and bite into the surface dirts, which is added on top of the trees. Gradually, a bank of debris begins to grow -- a spoil bank -- and as the machines meet the rock, they shred it with powerful explosives. Power shovels come to help the bulldozers. Ton upon ton of shale rock, which disintegrates into clay when exposed to air, is added to the fast-growing bank. (Sterile subsoil -- upon which nothing will grow because it has been rendered devoid of life-giving minerals -- is unearthed and piled on top. When it rains, the pile soaks up water like a sponge and takes on a viscous quality.) Now the coal is exposed. It looks like a solid black roadway. Small tractors with brushes whisk away the last dirt from the exposed vein. The power shovels break up the coal and lift it onto trucks which haul tons at a time to the railhead.

Even as this coal is being put onto trucks, bulldozers up ahead cut new swaths in the land. As they move one, the mountains of spoilbanks remain as a permanent, festering scar that will never heal. When it rains and the banks become

> soggy, they tear loose and slide down mountainsides, scouring off timber and topsoil. Families are often sent scurrying. The banks pour onto the croplands below, covering them with barren subsoil which may lay dormant for decades. This is how the coal areas have been ravished. The disaster visited on them is called strip mining.[39]

Between the Civil War and World War I, most of America's coal was extracted through shaft mines, intricate networks of tunnels running miles beneath the earth. Strip mining is much faster and requires fewer men. Technological improvements on the already incredible stripping machines make the operation even more profitable. The new gougers demolish tracts of land by the hundreds of square miles.

Legal efforts are now being made to protect such lands from future degradation. States have enacted a variety of laws designed to require abatement of acid mine drainage and requiring regrading and revegetation of surface mines. But the technology for preventing mine drainage is imperfect, and according to one mountaineer:

> "Strip mining laws are kind of like letting a fellow go ahead and commit rape -- provided he signs a bond guaranteeing to restore the victim to her original condition -- it can't be done."[40]

Moreover, the problems surrounding who should pay to reclaim orphaned mines (those abandoned before present laws) remain serious. For example, to abate acid mine drainage alone, from underground and surface mines it is estimated that $6.6 billion would be required.[41]

The coal industry of 1971 is very different from what it was ten years ago. For a while coal production was moribund, until late in the 1960's when a revival began that is still under way today. Part of the coal industry's renaissance is due to the cyclical scarcity of other fuels. Natural gas is in short supply because of diminishing reserves and producers holding back for higher prices. Fuel oil costs have also escalated. The ever-increasing demand for steel has likewise again boosted the need for coal. Steel mills around the world are running short of coking material. With electric power needs doubling every ten years, there is little likelihood of a slowdown in the coal boom.

The trend in the coal industry of the 'Seventies is toward size, speed, and efficiency. A greater and greater volume of production seems inevitable.

II

SIDE EFFECTS OF COAL MINING

Like all of man's activities, coal mining has its share of environmental insults. Foremost among these is the degradation of streams by acid drainage and sedimentation. Eight of the nine coal-producing states in the Appalachian Region suffer from these side effects.* Closely related are subsidence from underground mining and the ugliness, safety hazards and diminution in land values created by surface mining. Coal extraction may also result in fires in coal seams and refuse piles. This chapter will first describe mining methods, and then take up each problem, describe its causes and effects, and note the remedial measures recommended for its abatement.

Coal mining presents some environmental problems which are not discussed in this chapter, although some of the remedies mentioned will also ameliorate them. These include airborne dusts from extraction and preparation, shocks from explosives and abandoned equipment.

Many of the problems created by coal mining are also created by other mining operations (e.g., clay, iron, stone, sand and gravel), or other earth-moving activities (e.g., building construction). Only coal mining is considered here, however, and difficulties unique to extraction of other minerals will not be discussed. Table 3, at the end of this chapter, provides a picture of the relative status of coal and other minerals with regard to surface mining side effects.

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*Alabama, Kentucky, Maryland, Ohio, Pennsylvania, Tennessee, Virginia and West Virginia. Georgia is the only Appalachian coal-producing state without a significant water quality problem resulting from coal mining. Mississippi, New York, North Carolina and South Carolina are the other states in the Appalachian Region; they do not produce coal and their waters reportedly have not been adversely affected by coal mine effluent.[42]

A. Methods of Mining Coal[43]

Before coal is mined, a prospecting operation may take place, typically in the form of drilling or bulldozing. More modern techniques such as helicopter surveys may be useful in some circumstances. Where ground methods are used, construction of access roads may also be necessary.

Methods of mining coal fall into two broad categories: underground and surface. In underground mining, man and machine work in tunnels beneath the surface to cut, tear or blast the coal away from its resting place. The coal is then loaded onto conveyor belts or shuttle cars which remove it from the mine. An underground mine is called a shaft mine when it is reached by means of a shaft dropping vertically from the surface. When the entrance drops at an angle, the mine is a slope mine. When the coal outcrops (comes out) on a mountainside, mining may proceed horizontally from the surface directly into the coal bed; this is a drift mine.

Although some cutting of bituminous coal is still done by hand in the United States, almost all is mechanical.[44] Traditionally, the "room-and-pillar" method has been used. Parallel tunnels ("rooms") fourteen to twenty feet wide are driven into the coal bed, leaving pillars of coal to support the roof. Artificial supports such as timber and roof bolts are also used. The deposit is transformed into a subterranean checkerboard of room and pillar. When mining in an area is near completion, the pillars may be removed ("robbed") to obtain the coal in them.

One mechanical technique which does not follow this room-and-pillar method was recently imported from Europe and enjoys growing popularity. Called longwall mining, a whirling plow or plane shaves off the coal as it is pulled along the coal face. The mine roof is supported by jacks which follow the machine as it moves forward into the coal, permitting the roof behind to collapse. In 1969, about two per cent of underground bituminous coal mining in the United States was done by the longwall method.[45]

The rate of recovery of coal from the deposit in underground mining is relatively low, recently averaging 57%. This average hides a wide variation among individual mines, which range from 29% to 91% recovery. One reason for this is that faster breaking, loading and removal of the coal reduces the need to leave large pillars for long-term support of the roof -- at least insofar as protection of workmen is the purpose of such support. Longwall mining is perhaps the most efficient technique in terms of recovery rate.

Surface mining for coal usually consists of strip mining and, in hilly areas, augering. In strip mining, the earth, rock and vegetation above the coal deposit is removed by bulldozer, power shovels or drag lines. These machines are sometimes behemoths, capable of chewing as much as 220 cubic yeards of earth at a bite and quickly spitting it out nearby. After this "overburden," or "spoil," is removed, the exposed coal is scooped out by smaller power shovels and loaded onto trucks.

When the topography is relatively flat, surface mining takes the form of area stripping. The overburden and coal are removed in a long trench. A parallel second trench is then made, with the spoil being piled in the first trench. Successive parallel cuts are made, accumulating row upon row of spoil ridges and a final empty trench. In rolling or mountainous country, as is most of Appalachia, contour strip mining is practiced. The overburden is first removed above the outcrop of the coal bed, with the spoil placed at or over the edge of the down slope. Additional cuts are made into the hillside until the ratio of overburden to coal makes the operation uneconomical. This produces a "bench" on the hillside, bordered on the outside by a spoil-covered rim and down-slope, on the inside by a stark "highwall" rising as high as 100 feet or more, encircling the bewildered mountains for miles. Some mines may combine features of both area and contour stripping, particularly in the anthracite region of eastern Pennsylvania where the surface slopes are relatively gentle but the coal beds are thicker than bituminous deposits and vary in pitch up to 90 degrees.

When contour mining stops because the overburden is too high, augers are put to work. These are mammoth screws up to seven feet wide which bore as much as 200 feet into the exposed coal face to extract the coal. A series of deep thinly-divided caves are produced in the mountainside.

Although strip mining is often called open pit mining, the latter is sometimes distinguished. Both involve flaying the earth to expose the mineral, but open pit mining usually refers to recovery of deposits which are much thicker than those obtained by stripping. The overburden is relatively small compared with the amount of mineral removed, and a single pit may be operated for a long period of time. Some have been in operation for more than a century. Limestone, marble, sand, gravel, iron and copper are often quarried or mined by the open pit method. Where coal deposits are particularly thick, as in the Pennsylvania anthracite fields, open pit extraction may also be used.[46]

Surface mining has enjoyed growing favor with producers and for good reason -- it is much more efficient than underground mining. It permits recovery of more of the coal in a seam and eliminates the problem of roof support. When the overburden is too thin for underground mining, it is the only way the coal can be extracted. It is also not as labor intensive.

Although coal was commonly extracted by crude surface methods in the early Nineteenth Century, strip mining as we now know it awaited the development of large earth-moving machinery. In 1915, less than one per cent of bituminous coal production in this country originated in strip mines. This slowly increased, but did not exceed ten per cent until 1941. War demand then produced a sharp boost, and by 1946 the proportion stripped had jumped to 21%; in 1970 it was 40% of total production. Anthracite stripping has had a similar history, except that as anthracite production has diminished over the past quarter-century the proportionate share stripped has increased. In 1970 it was 50%. Coal augering began in 1945, and was credited with more than three per cent of total bituminous production in 1970.[47]

Whether these trends will continue in the future depends on many factors -- the demand for coal, the location of potential coal deposits, legal controls, and technological development. As modern technology increases the amount of coal which can be recovered in an underground mine, so does it increase the depth of overburden which shovels and draglines can remove -- and the degradation and waste produced.

This discussion of mining methods has focused on the activities of a single seam of coal. But Appalachian coal beds are often situated in two or more layers, separated by rock and other material. In such cases, multiple-seam mining may occur, producing such phenomena as two or three strip benches on a mountainside or one mining tunnel beneath another.

Once coal has been extracted, it may be sent through a nearby preparation plant to be crushed, washed, sized, and perhaps chemically treated. This produces such wastes as slate, shale, low-grade coal and coal dust. This waste is heaped in huge refuse banks ("gob" piles or, in anthracite mining, "culm" banks) which may be as high as 700 feet and more than a mile long.

Refuse piles are not the only destination of processing wastes. Fine refuse usually is piped to settling ponds or discharged to adjacent streams as "blackwater" -- water heavily laden with suspended coal dust. Dust may also become airborn.[48]

Some coal is sent from the mine directly to consumers -- chiefly utilities with equipment which does not require processed coal. Almost two-thirds of bituminous coal production in the United States does go through a preparation plant, however.[49]

The waste coal which has been discarded in the mining and preparation process is a source of new production, at least in the anthracite fields of Pennsylvania. Almost one-third of 1969 anthracite production came from the re-working of culm banks, and river dredging produced another five per cent.[50]

The tables which follow summarize the amounts and methods of coal production.

TABLE 1

TOTAL PRODUCTION

BITUMINOUS COAL AND PA. ANTHRACITE

(millions net tons - rounded)

	U.S.	Md.	O.	W.Va.	Pa.	Pa.Anthr.
1870	33.0	x	1.3	.6	10.8	14.2
1890	111.3	3.4	11.5	6.3	40.9	45.0
1900	212.3	4.0	19.0	21.2	79.3	57.4
1910	417.1	5.2	34.2	59.3	148.8	83.7
1920	568.7	4.1	45.9	89.6	166.9	89.6
1930	467.6	2.3	31.9	122.4	123.4	68.8
1940	460.8	1.5	22.1	126.6	111.4	51.5
1950	516.3	.5	36.9	145.6	103.4	46.3
1960	415.5	.7	34.0	120.1	65.6	17.7
1970	602.9	1.5	55.1	143.1	80.1	9.2

Bituminous coal figures include lignite, where appropriate.

Sources:
U.S. Dep't. of Interior, Bureau of Mines, Minerals Resources 1870, 1890, 1900, 1910, 1920, 1930.
U.S. Dep't. of Interior, Bureau of Mines, Minerals Yearbook 1940, 1950, 1960.
U.S. Dep't. of Interior, Bureau of Mines, Weekly Coal Report #2815, 1970.
State of West Virginia, Department of Mines, Annual Report, 1970.
Annual Report of the Maryland Bureau of Mines, 1970.
Commonwealth of Pennsylvania, Department of Environmental Resources, Anthracite, Bituminous Coal and Oil and Gas Divisions, Annual Report, 1970.

TABLE 2

METHODS OF PRODUCTION AS PERCENTAGE OF TOTAL PRODUCTION
BITUMINOUS COAL

	U.S.			Pa.			W.Va.			O.			Md.		
	UG	Strip	Auger	UG	Strip	Auger	UG	Strip	Auger	UG	Strip	Auger	UG	Strip	Auger
1915 -	99.4	.6	x	100	x	x	100	x	x	98.8	1.2	x	100	x	x
1920 -	98.5	1.5	x	99.3	.7	x	99.9	.1-	x	92.8	7.2	x	100	x	x
1930 -	95.7	4.3	x	99.4	.6	x	100	x	x	95.0	5.0	x	100	x	x
1940 -	90.8	9.2	x	96.4	3.6	x	99.3	.7	x	77.8	22.2	x	100	x	x
1950 -	76.1	23.9	x	75.0	25.0	x	91.0	9.0	x	39.7	60.3	x	75.1	24.9	x
1960 -	68.6	29.5	1.9	67.4	31.9	.7	91.8	5.7	2.5	27.1	70.3	2.6	34.8	65.2	x
1970 -	56.2	40.5	3.3	69.1	30.2	.7	81.8	15.4	3.5	33.0	64.5	2.5	16.0	76.0	8.0

Notes:

Bituminous coal figures include lignite, where appropriate.
1915 first strip mining production figures collected.
1952 first collection of auger production figures.
x = no reported production. (U.S. Bureau of Mines figures do not include strip mine production from mines producing less than 1000 tons per year.)

Sources:

U.S. Dep't.of Interior, Bureau of Mines, Minerals Resources 1915, 1920, 1930.
U.S. Dep't.of Interior, Bureau of Mines, Minerals Yearbook 1940, 1950, 1960.
U.S. Dep't.of Interior, Bureau of Mines, Weekly Coal Report #2815, 1970.
State of West Virginia, Department of Mines, Annual Report, 1970.
Annual Report of the Maryland Bureau of Mines, 1970.
Commonwealth of Pennsylvania, Department of Environmental Resources, Anthracite, Bituminous Coal and Oil and Gas Divisions, Annual Report, 1970.

B. Acid Mine Drainage

1. Cause and Effect

Not all water which drains from mines is degraded by acid and related pollutants. But a major share of the economic damage caused by mine drainage is attributable to acidity, and more than ninety per cent of acid water pollution is associated with coal mining.[51]

The villain of mine acid formation is pyrite, a compound of iron and sulphur frequently encountered in and around coal deposits. A typical scenario in an underground mine follows. When the coal is extracted, the pyrites in the mine are exposed to oxygen and water vapor. These react, oxidizing the pyrite. (There is some evidence that bacteria exercise a catalytic role in this reaction, but their significance relative to non-biological factors is not yet known.[52]) The resulting products are washed or seep off the mine walls into ground water, which flows along the mine floor with a further oxidizing and hydrolyzing effect. The total reaction is completed in the receiving stream, which is then burdened with acid, sulfates and iron oxide (ferric hydroxide), and often other dissolved minerals such as aluminum, magnesium, manganese, calcium, and ferrous iron. The red-yellow iron oxide, known as "yellowboy", is only slightly soluble in water, and typically precipitates out onto the streambed.

The amount of acid produced by a coal formation depends on a variety of factors -- especially the availability at any given time of the three elements in the reactive process.[53] The amount of sulfur-bearing material in a seam varies with the region, and among different seams in the same region.[54] Refuse piles outside of underground mines are often heavily laden with sulfuritic material. At a surface mine pyrites are found in and around the exposed coal face in the highwall and in auger holes. Surface mine spoil piles also may be infused with pyritic material, but typically lower in amount and less widely distributed than in refuse banks. Roads built with mine refuse also may contain pyrite, but the practice of using refuse for this purpose has been greatly restricted in practice, and in some states prohibited by law.[56]

Air provides the oxygen necessary for the initial reaction. Even if an underground mine is sealed so normal air currents are shut off, differences in atmospheric pressure inside and outside a deep mine may cause the mine to "breathe" -- to inhale and exhale air through cracks in the surface above the mine or in the rocks surrounding the seal. When the pyrites are covered so that oxygen cannot reach them, oxidation will not take place or will proceed at an insignificant pace. Water may provide such a shield. Underground mines and strip pits in which all pyritic materials are submerged will not produce acid. This shielding occurs naturally in mines which are beneath the water table.[57]

The water necessary for the initial oxidation reaction is typically in vapor form. In Appalachia, the relative humidity underground is high enough that oxidation is not generally limited by a lack of water.[58]

The products of the initial oxidation reaction are washed away from the pyrite surfaces by liquid water. The most consistent mechanism underground is the slow formation of droplets at the pyrite surface which seep down to ground water flowing ultimately to receiving streams. The periodic rise and fall of the water table and precipitation filtering through the overburden also may flush out oxidation products underground. Direct precipitation is particularly important where toxic materials are above ground, as in strip pits, refuse banks and spoil piles; however, surface and ground waters can also affect these sources, as where a strip pit interrupts the water table.[59]

Although acid mine drainage primarily affects surface water, the quality of ground water also can be altered.[60] Ground water is no respector of mine boundaries, but it may be influenced by them, and water flowing into a mine may have passed through another mine nearby. Hence the receiving stream may receive mine drainage whose acid load is only partly or not at all caused by the mine from which the waters emanate.

Melting snow and greater precipitation in the late winter and spring may significantly increase the amount of acid drainage. This results both from a greater washing away of the products of the initial oxidation reaction and from flushing out acid which may have been created earlier but which did not have an opportunity to drain out of the mine, refuse bank or spoil pile. In any season, a particularly heavy storm may create a "slug" of acid in the receiving waters. Paradoxically, precipitation may also result in lower pyrite oxidation by creating a rise in the water level which submerges pyrite surfaces.[61]

In addition to the variables described in the last few paragraphs, one must take into consideration the effect on mine drainage of other elements in the surrounding strata or in the receiving waters. Alkaline materials such as limestone in the surrounding strata will neutralize all or in part any acid formed or even make the drainage alkaline. The nature of the surrounding strata also will determine what dissolved metals and other constituents are in the drainage. Acid in the receiving stream may be neutralized by alkalines naturally in the stream or discharged to it by riparian industries. The harmful effects of acid also depend upon its concentration in the receiving waters, which varies with such factors as the stream's size and flow.[62]

The amount of acid produced by a mine depends to some extent on the type of mine involved. The worst offenders are self-draining underground and auger mines. Even after the mine is abandoned, pyrites are continually exposed to air and water, and new pyrites appear as roof and walls collapse or crumble. The peril is increased if the overburden is thin, since collapse of the roof will result in cracks and fissures which permit air and water to reach the toxic materials easily. Acid drainage from such mines is likely to continue interminably unless its formation is stopped -- and it is very difficult to stop.*

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*Longwall mining can be especially hazardous since it produces an immediate collapse of the roof behind the area being worked as the coal is mined, filling the cavity with loose material and creating cracks above.

Underground mines which are below drainage risk acid creation during active mining, but will usually flood upon abandonment and cease acid formation. Strip mines may produce more acid than underground mines during early stages, and may continue to produce large amounts if not properly reclaimed. Acid drainage is ultimately more controllable in surface mining, however, since proper reclamation will bury or inundate toxic material.

In the Appalachian region, 71.3% of the acid mine drainage is estimated to originate in underground mines. Surface mines account for 12%, combined surface and underground mines 7.3% and other sources (coal processing plants and refuse piles from inactive mines) 7.5%. Inactive mines and refuse piles are the source of 78% of Appalachia's acid drainage, with inactive underground mines accounting for two-thirds of that amount. More than 85% of the drainage from active mines originates in underground mines.[63]

As suggested above, differences in geography, geology, hydrology, mining method and season affect the gravity of the mine drainage problem. It is relatively insignificant in the coal regions of the western United States, because of the dry climate and alkaline waters. It is not as serious in southern Appalachia as in northern Appalachia, because of lower sulfur concentrations and greater alkaline materials in surrounding strata.[64]

More than 5700 miles of Appalachian streams are continuously or intermittently sullied by acid mine drainage. Three-quarters of them are in the Susquehanna, Allegheny and Monongahela River Basins in Pennsylvania and northern West Virginia. Pennsylvania suffers most from this blight in stream miles affected and tons of acidity produced. In Ohio many streams in the eastern area are affected, particularly in the Muskingum and Hocking River Basins and Raccoon Creek. In Maryland, streams near the Savage River Reservoir and the North Branch of the Potomac River have acidity problems.[65]

In general, mine acid and its companions impose costs on industrial and municipal water users; corrode be-watered objects; eliminate or diminish aquatic life, and reduce the value of water resources for recreational purposes.[66] Industries in the area use water chiefly for boiler and cooling functions. High acidity and hardness cause corrosion of equipment and scale formation, requiring treatment of the water and, in the case of scale, periodic removal. Other constituents must be removed to make water usable for specific industries -- for example, iron and manganese in textile dyeing and metal plating. Municipal water institutions typically must either treat acid water or obtain alternative sources of supply. Treatment consists primarily of neutralizing the acid and bearing the increased hardness of the water. Damage to boats such as barges and towboats consists chiefly of accelerated corrosion, requiring increased maintenance or earlier replacement of equipment. Damage to highway and navigation facilities such as culverts, bridge piers and dam structures also consists chiefly of corrosion and is usually met by using corrosion-resistant metals in construction.

The productivity of aquatic plant and animal life generally is considerably reduced when acidity falls below a pH of 5.0, a phenomenon which acid drainage may well induce. In addition to its effect on conservation values, this reduces the use of water resources for fishing. High acidity as well as related eyesores, such as yellowboy, reduce the value of water resources for recreational purposes such as swimming, water skiing and boating. Although difficult to quantify, these losses must be taken into account in developing any drainage control program.

2. Remedies

Eliminating or reducing the effects of acid drainage involves one or more of four basic methods: treatment to remove the acid and related constituents, abatement at the source, disposal or dilution. The method chosen depends upon the source and nature of the drainage, the use to which the land and receiving waters are to be put and the financial resources available. There is no single technique which will be appropriate in every case, and there are some cases where no measure will be adequate. Little is known about the effectiveness of many suggested techniques.

a. Treatment[67]

The treatment technique most widely tested and used is lime neutralization. Typically, this involves construction of a plant to handle neutralization and aeration of the drainage or stream water, and one or more lagoons for settling the resulting sludge. This reduces the acidity and removes the iron, aluminum and most other dissolved minerals associated with it. But it has at least two major drawbacks. First, it produces a relatively large volume of sludge which is difficult to dispose of. As with sludge from municipal sewage treatment plants, the disposal problem is likely to become more serious as treatment requirements are more widely imposed. Second, it does not reduce, but usually increases, the hardness of the water. Water hardness is not as grave a problem as acidity, but it requires treatment of its own for certain industrial water uses such as cooling, and renders water less satisfactory for domestic uses.

Another method which has much potential for certain types of drainage but which is still in the early stages of technological development is reverse osmosis. The great advantages of reverse osmosis are that it produces a relatively pure water and results in a lower volume of waste than lime neutralization, but brine must still be disposed of. Other treatment processes are in various stages of investigation.

b. Abatement at the Source[68]

Although treatment is often necessary, abatement at the source is the ultimate objective. Some drawbacks of known treatment techniques have already been mentioned. More important, treatment must be kept up as long as acid is produced -- which may be indefinitely. Even though the cost of at-source abatement may be higher than that of building treatment facilities, the continuing expense of treatment is likely to make it much more costly in the long run. Assuming the existence of pyrite, abatement at the source consists of reducing or eliminating one of the other ingredients of acid formation and transport: oxygen and water.

In active underground mines, oxygen entry cannot be prevented. However, some of the techniques used to prevent oxygen entry to inactive mines may be applicable to those parts of active mines in which mining has been completed.

The most effective method of cutting off the oxygen supply to an inactive underground mine is flooding it. With mines below drainage, this can be done and may occur naturally, although it may be necessary to seal mine openings. It is much more difficult to flood mines which are above drainage, since water in the mine is likely to leak out, particularly around the outcrop, although leakage points may be sealed. Impounded water may also break through a weak outcrop barrier or a mine wall destroyed by later mining. Although water seals of a bulkhead nature were used as early as the 1930's and have been used in active mines to stem flows from worked-out areas, the technology is not yet perfected. Problems of water break-outs suggest the need for leaving a sufficiently strong wall or thickness of outcrop where flooding is a possibility, and for keeping records of flooded mines. Before new mining operations start records should be checked to determine the location of abandoned mines which are likely to have flooded.

Somewhat similar to the concept of mine flooding is the idea of keeping out oxygen by filling the mine with an inert gas. But little is known about this technique other than that it would require continued maintenance to keep the mine filled at the appropriate pressure.

Rather than flooding, most attempts to limit oxygen have involved cutting off the air supply by shutting all mine entrances with air seals. This was the major technique used in the sealing program of the Works Progress Administration during the Depression. But air seals have been disappointing. Although they may cut acid formation as much as 40%, the "breathing" phenomenon noted earlier prevents any greater reduction.[69] It may be possible to locate and seal the cracks and crevices through which the mine breathes, but subsidence of the overburden and shifting around mine openings may result in the creation of new openings.

Seal installation and related activities often require clearing the mine portal, sometimes at considerable expense. In addition, entry onto the surface above the mine, building access roads, tree-cutting and drilling may be required. After a seal is constructed, protection against subsequent deterioration will usually be necessary, through periodic inspection and maintenance.

Control of water movement to and from the mine is another method of limiting acid formation and transport. This involves diversion of surface or ground water away from entry into the mine, or diversion of drainage to receiving streams that can more easily handle the load, using such devices as flumes, tunnels and pumps. These devices are often used to prevent flooding while mining is actively in progress. In the Pennsylvania anthracite region, where distorted rock strata create special problems, large underground drainage tunnels and pumping facilities have been constructed to dewater abandoned mines, particularly so as to reduce the danger to active mines. Although diversion techniques are of value in limiting acid formation, oxygen control remains the most likely mechanism available for abatement at the source.

Surface mining typically removes more of the coal in a given area than underground mining and, if properly reclaimed, is less subject to acid creation when mining is completed. Stripping out the remaining coal and reclaiming the surface may thus be the most effective method of stopping acid formation in an abandoned underground mine.

Reduction of acid formation from active surface mines centers around water diversion through such devices as drainage ditches above the highwall and draining or pumping water quickly out of the strip pit. As with underground mines, however, treatment is often necessary.

Insofar as acid formation in inactive strip pits is concerned, the availability of oxygen may be eliminated by covering the exposed coal face with earth. As with underground mines, water impoundments also will prevent acid formation as long as all sulfurous material is inundated. These impoundments can be used for recreational purposes and will support aquatic life.

During active mining, it may not be possible to stop acid formation in refuse and spoil piles. If disposal of the pile is not otherwise practicable, drainage treatment is necessary and the primary concern is preparation of the pile for proper reclamation afterward. With spoil piles, this requires separation of top soil from sulfuritic materials and the rest of the overburden, so that the sulfuritic materials may be buried in the cut. One of the major problems with spoil piles from surface mines operated before the imposition of separation requirements is that toxic materials were frequently placed at or near the top of the pile, since they were often the last to be excavated before reaching the coal. With refuse bank operations, it may be appropriate to create alternate layers of refuse and sealing material, such as clay. Grading and compacting may also be necessary.

To the extent a refuse bank or spoil pile can be buried -- in a strip pit, for example -- oxygen and water supply will be limited. With spoil piles, burying toxic materials and backfilling the rest of the spoil is common reclamation practice. This is harder at inactive mines because of such factors as impaction of the pile, the presence of logs and boulders, and logistical problems in moving the pile, especially if it is very large. Burial of the toxic materials from a refuse bank is more difficult; the pyrites are more pervasive in the bank and the cost of transporting the whole pile is likely to be prohibitive. However, this technique has been used in some cases, and may be particularly appropriate where an old underground mine is being stripped out.

The most common method of protecting against acid formation in abandoned refuse banks and spoil piles is growth of a vegetative cover. Typically, this is preceded by the application of fertilizers and a neutralizing agent such as lime, and may also be preceded by regrading and the application of a layer or layers of "sweet" soil, although some grasses have been grown directly on a refuse or spoil pile high in pyrites. A vegetative cover tends to use the oxygen in the upper layer of the pile. It also prevents erosion, thus limiting the extent to which new pyritic materials can be exposed. Difficulties in establishing a vegetative cover may be encountered, however, particularly if the pile is so toxic it exceeds the capacity of neutralizing agents.

Even if a vegetative cover is established, it may take several years before precipitation which infiltrates the pile cleans out oxidation products previously formed. Drainage ditches may limit the access of surface and ground water to the pile, but it is difficult, if not impossible, to prevent the direct entry of precipitation other than by an impermeable cover. Impermeable covers are usually impractical, however, due to their cost and appearance.

One method suggested for reducing pyrite oxidation is the application of inhibiting chemicals or bactericides. This is particularly difficult in underground mines, where the pyrites are often hidden in cracks and joints and new materials are continuously being exposed through crumbling of roofs, walls, and pillars. Inhibitors would have to be applied in vapor form and be kept up in sufficient concentrations. Even where liquids could be applied, as on refuse banks and spoil piles, there is little experience to demonstrate their effectiveness.

c. Deep Well Disposal[70]

Some industries have developed techniques for the injection of waste liquids into geologicl formations deep underground, and this has been contemplated as a device for disposing of acid mine drainage. The drainage would first have to be treated to remove suspended solids, which would produce a sludge. A greater drawback is the lack of knowledge as to what happens to waste liquids after their injection underground, an ignorance particularly hazardous where toxic substances are involved. Ultimately, too, such disposal only postpones the necessity of dealing with the problem. These factors have made deep well disposal relatively unpopular as a remedy for industrial wastes.

d. Dilution

Acid is naturally diluted in receiving streams. One method suggested to diminish acidic effects is to control stream flow, so as to reduce spring peaks and the shock of sudden slugs. Augmentation of stream flows during low-flow periods in summer and fall due to operation of upstream reservoirs is thought to have reduced the effects of acidity in the Youghiogheny and Monongahela Rivers over a 40-year period.[71] This technique requires construction of dams or using dams built for other purposes, such as flood control.

e. A Note on Costs

The cost of comprehensive mine acid programs for abandoned mines is enormous. The Department of the Interior estimated the total expense in 1969 for a national 20-year 95% abatement program at more than six billion dollars, plus subsequent operating expenses.[72] The Pennsylvania ten-year abatement program is tagged at 935 million dollars, plus an annual expense of 38 million dollars for operation and maintenance of completed facilities (treatment plants, mine seals, dams for stream flow regulation, etc.).[73]

A 1970 report on the proposed Slippy Rock Creek (Pa.) Mine Drainage Pollution Abatement Project gives a more specific example of costs on a watershed basis. This watershed contains 13,700 acres of land affected by strip mining, 2,700 acres of which discharge acid. Fifty-two major and many minor deep mines have 263 known openings, with 156 requiring hydraulic sealing. Other problems such as refuse piles and abandoned oil and gas wells also exist. All these sources emit eight thousand pounds of acid daily. A program costing $9,867,000 was estimated to be necessary to achieve 80% reduction of this acid land, through mine and surface sealing, grouting of adjacent strata, strip mine reclamation (backfilling to original contour or terracing, soil treatment, planting, diversion ditches, flumes), refuse bank control (burial in strip pits, or grading and establishment of a vegetative cover) and other techniques.[74]

Some of the difficulties in dealing with abandoned mines have already been noted. The cost of many installations and techniques is considerably reduced when done in the active mining process, since they may be planned and incorporated into the operation. As noted by the Appalachian Regional Commission, Pennsylvania's experience in requiring abatement of pollution from active mines suggests that "the coal industry, in general, can support this additional overhead cost," although the effect on particular firms and the make-up of the industry and market is not known.[75]

C. Erosion, Landslides and Sediment

1. Cause and Effect

Whenever vegetation or other holding covers are removed from the earth's surface, erosion may result. The run-off of surface waters carries loose soil, rock and undissolved mineral matter to the receiving stream. Landslides also contribute these contaminants. The risk is incurred by any of man's earth-moving activities, from building and highway construction to farming.

The major mining malefactor is surface mining. Spoil piles are huge mounds of erodible material. If they are steeply graded or piled on steep slopes, the risk of erosion is increased. Substandard access, haulage and prospecting roads are another major sediment source, with a rate of soil loss which may be as great as that from spoil banks.[76] Underground mining, too, can produce sediment, particularly through erosion of refuse banks. Coal preparation plants contribute wastes such as coal dust to a stream's cargo of suspended solids.

Where contour stripping is done, erosion, landslides and sedimentation become more serious as rainfall and slope steepness increase. A survey of 25,000 miles of contour bench revealed spoil material stacked on the outer edge for 18,000 miles and pushed off the bench for 7,000 miles. Stabilization of spoil material becomes especially difficult when slopes exceed twenty degrees. Water absorbed by the loose spoil both lubricates the interface between the spoil and original surface and increases the weight of the spoil burden. Landslides have occurred even after an area has been reclaimed.[77] A study in Kentucky revealed that the sediment yield from coal spoil piles was as much as one thousand times that of undisturbed forest.[78] Sedimentation is particularly severe after rainstorms if surface run-off is not adequately controlled -- a condition found to exist on 98% of surface mined land in Appalachia.[79] The giant spoil ridges formed by area strip mining suffer erosion comparable to contour stripping spoil piles, but the effect on nearby streams and adjoining land is not as grave because much of the sediment stays in depressions at the site.[80]

The effect of erosion on acid formation in refuse banks and spoil piles has already been mentioned. Erosion generally creates gullies and makes revegetation and related land uses more difficult. It also renders access roads less useful for beneficial purposes to which they might otherwise be put -- for example, access to recreation facilities which might be created in reclaimed surface mined areas or fire protection for reforested areas.[81] Landslides cover trees and other vegetation, damage nearby land and buildings, and block roads and streams. The sediment contributed to streams by erosion, slides and other sources is a serious problem throughout Appalachia.[82] Suspended solids carried by streams destroy fish habitats and negatively affect aesthetic and recreational values. The cost of water treatment for municipal and industrial use is increased. When sediment settles, it chokes streams, channels and reservoirs. The natural storm-carrying capacity of streams near strip areas may be lowered by two-thirds or more. Flooding increases and marshy areas develop. Aquatic life is endangered by blanketing of the streambed, modification of stream flows and changes in water temperature and spawning beds. Aesthetic and recreational values are undermined.

2. Remedies

Perhaps the first principle in the control of erosion, landslides and sedimentation from contour surface-mining is that the amount of spoil placed on the outer edge of a bench should not exceed the capacity of the slope to bear it. Given the possibility of extreme climactic conditions and geological changes, it is impossible to prevent all erosion or landslides, but general protective measures relating bench size (including spoil) to slope can be established. As a corollary of this principle, where a slope is too steep to support loose spoil no mining should be done which would result in spoil being placed on or over the outer edge of the bench. Although this may prevent surface mining in some situations, it does leave open the use of techniques which do not involve outside spoil placement. The grade at which this point comes is subject to some dispute. The Maryland and West Virginia laws set it at 33 degrees. But soil stabilization on slopes above 20 degrees is particularly difficult and this arguably is the proper limit.[83]

As with acid formation, control of surface water is important to reduce erosion and landslides. Diversion ditches above the highwall can channel water away from the mining site. Devices to prevent bench drainage from infiltrating and eroding spoil material depend on terrain, soil and other factors. Check dams, stone rubble, culverts or piping may be appropriate.[84] Pumping may be needed, especially during active mining. Sedimentation ponds to permit settling of suspended solids before surface run-off reaches the receiving stream may also be necessary.

Proper grading and compaction of spoil materials is another important device to limit erosion or, in the case of area mining, to confine sediment to the mined area. Typically this includes backfilling of the strip pit, which also covers toxic material and limits acid formation. A description of grading techniques will be found in the next subsection of this chapter.

The most significant soil stabilization device probably is the establishment of a vegetative cover. (Artificial covers also may be effective, although, as previously suggested, their practicality is limited.) For this to be done most fruitfully, separation of topsoil during active mining is useful so that it may be replaced after backfilling and grading. The measures previously suggested to limit the effects of sulfuritic materials, such as application of neutralizers, may be necessary to aid plant growth. Fertilization may also be necessary. It is important to establish plant cover as quickly as possible, since the risk of erosion will continue until it has taken hold. Even where tree planting is desired, a quick preliminary shield of grasses and legumes may be appropriate. In a study of Appalachian sites reclaimed by tree planting alone, more than three-quarters were found to be giving off silt, sediment and acid.[85]

The techniques just described are part of the basic reclamation package. As with acid drainage control, it is important that they be considered before mining so they can be made part of the operating plan, and that such measures as must await completion of the extraction process be begun as quickly as possible, although mining of the entire site may not be finished.

Inactive mines require application of the same reclamation techniques as active mines, but this may be much more difficult. Previous slides and compaction make backfilling and grading more difficult and failure to separate toxic material and topsoil may have left a stony spoil pile difficult to revegetate. In some cases, however, vegetation may have begun naturally in abandoned surface mine sites and the objective may be to reinforce this growth.[86]

In cases where new mining is done next to abandoned surface mines, it may be efficient to reclaim the old site along with the new. In Maryland, for example, this has occasionally been done with the state contributing to the cost, where appropriate, out of the state reclamation fund.

Limitation of sediment from refuse banks involves basically the techniques of diversion, run-off control, grading and planting described above. The problem of toxicity is more grave and the special techniques described in the previous subsection will often be necessary. For active mining operations, special precautions may be necessary to assure refuse piles are not too near stream banks, so as to avoid the hazard of stream banks caving.[87]

Where access roads contribute to the sediment load, repair or obliteration of the road may be necessary.[88] Presumably, repair would include construction of water diversion devices. New roads for active mines must be so constructed as to reduce the risk of erosion.

D. Other Surface Mining Side Effects

Surface mining destroys scenic values. Highwalls can render mountaintops useless by cutting off access and, along with unreclaimed pits, create safety hazards. Dust from active operations and unreclaimed spoil piles may fill the air and settle on nearby lands and buildings. Coal trucks contribute to deterioration of roads and bridges. Abandoned pits become dumping grounds. During active mining, competing uses for the land by humans and wildlife are limited or eliminated and may take years to reinstate. Where the area is not properly reclaimed, the land's productive value may be destroyed and the property tax base undermined. Finally, the collected detriments of surface mining in any given area may demoralize the local population forcing them to either suffer these indignities or to flee.

The items in this catalogue vary in their gravity from region to region and from mine to mine. Much coal mining in Appalachia takes place in relatively remote mountain areas, where the problems do not affect as many people or create as much economic dislocation as they otherwise might. Even in these areas, however, the problems are very real for the people who do live or visit there and the increasing demand for land for competing uses -- as continuing wilderness or for recreational development -- aggravates the difficulties.

The discussion in this section will focus on the limitation of destruction of scenic values and recreational and other productive uses. Most of the other items either are alleviated by measures designed to treat these difficulties and the others described in this chapter or are generally beyond the scope of this study.

Destruction of scenic values and competing land use as a result of acid drainage, erosion and landslides has already been mentioned. More dramatic, perhaps, is the havoc wrought by the machines themselves: in area stripping, giant earthen washboards of 50-foot spoil piles; in contour stripping, mile upon mile of bare highwall as high as 80 feet or more ringing mountains in as many as three or four layers. According to one estimate, by 1967 coal mining had created 20,000 miles of highwall in Appalachia.[89] Unreclaimed spoil piles and pits also add to the ugliness of contour-mined areas.

Surface mining necessarily destroys or limits the use of the mined area for other purposes. The immediate effects on human uses of the surface area are obvious. In Appalachia, much of this area is forest. When the natural vegetation is removed, it becomes virtually useless for wildlife because of the elimination of food, nesting and escape cover. Vegetation which returns naturally after mining is finished is likely to be less efficient for these purposes and thus produce a poorer wildlife habitat than previously existed.[90] A particularly acute land use problem is presented in those instances where surface mining is desired in locations already devoted to human use. Mining in parks and residential areas exemplify this conflict, but perhaps the most striking instance is the strip mining creeping toward the campus of Frostburg State College in Maryland.[91]

Except for outright prohibition of exploration and mining, little can be done about the destruction of scenic values and surface uses during active mining operations. Short of total prohibition, the amount of land being mined can be limited so as to reduce the total negative effect. This can be done by requiring reclamation to begin on any mine as quickly as possible or within a very short time after the coal is removed, or by limiting the total amount of open acreage in a region or state at any one time.

Where mining does take place, remedial measures must focus upon the reclamation process. The particular items of concern are highwall control, spoil pile and backfill grading and subsequent planting. Minimum requirements necessary to reduce acid drainage, erosion and landslides have already been noted. The following discussion centers upon additional devices appropriate for reducing ugliness, elimating safety hazards and restoring productive land use.

In some cases, highwalls can be screened by planting trees on the backfilled and graded bench. But this technique has somewhat limited value since it may take a long time to establish an effective screen -- as much as 60 years for an 80-foot highwall. Also, erosion would still be a serious problem during the five or more years it takes for the trees to establish a satisfactory root system, and the screen would not reduce the safety hazard presented by the highwall.[92]

Reduction or elimination of the highwall is more expensive, but also more effective. The study of reclamation at the Myles Job Mine in northern West Virginia describes six techniques and their applicability and cost for that mine.[93]

> (1) The spoil is bulldozed back to the highwall, so that the highwall is covered and the slope returned to its original contour. On steep slopes, however, the risk of erosion makes this unfeasible.
>
> (2) The top of the highwall is pushed into the bench and the spoil back toward the highwall, ultimately reducing the highwall grade to 25-degrees and setting the terrace grade away from the highwall at five degrees.
>
> (3) Material from the outer edge of the terrace is bulldozed back toward the highwall until the graded surface slopes away from the highwall at an angle of three degrees. The height of the highwall is reduced, but is not eliminated.
>
> (4) A modified version of the third method, additional spoil is pushed back against the highwall so that the slope comes away from the top of the highwall at a 25 degree angle.
>
> (5) The highwall is reduced by explosives to an angle of 25 degrees.
>
> (6) A more sophisticated version of the fifth, the upper portion of the highwall is cut by explosives to a 45 degree angle. The blasted material is used to cover the lower portion, so

that it slopes away from the highwall at an angle of 35 degrees.

The cost of these techniques varies from $250 to $850 per acre. These estimates are based on reclamation of an active mine, and they may vary not only among techniques but also among different topographical condition Reclamation of an abandoned mine becomes much more expensiv Spoil piles have become more compacted and more difficult to move; boulders and logs abound; equipment which would be at the site if it were an active mine must be moved to it. Thus, the cost of one technique was estimated at $400 per acre for an active mine, but $600 per acre for an inactive mine.[94]

Although the aforementioned corrective measures are the most effective, others may be useful in some cases. For example, a water impoundment may be desirable instead of complete backfilling of a particular cut. Where highwalls are left, roads to inaccessible areas may be built. Fences can reduce the hazards of highwalls and open cuts, and shrubbery can help provide a low screen.

The techniques which are used at any site depend on the conditions of the contextual environment and on cost. But apart from the minimum required to reduce or eliminate bad side effects, they also depend on the subsequent land use desired. In forested mountainous areas, the choice may be limited to reforestation, although growing demands for recreational areas may increase the alternatives. In other areas, development for residential, recreational or agricultural purposes may be attractive options. This is particularly true at area mining sites, where reclamation has generally been the most successful and varied. The availability of different options for post-reclamation land use suggests the need for reconciling different interests in the surface. If surface ownership has been severed from the mineral ownership, the operator and the surface owner may have contradictory desires. There may be adjoining surface owners with an interest. The public interest, particularly in wilderness, recreation sites or wildlife habitats, also will come into play.

E. Subsidence[95]

1. Cause and Effect

Surface subsidence is a product of underground mining. Removal of the coal takes away the support for the overlying strata. Without support, the mine roof bends, cracks and crumbles, ultimately filling the void and establishing a new equilibrium in the contextual strata. The effect may be felt at the surface in the form of earth movements, settling, depressions, fissures and potholes. Surface subsidence may occur for many years after the coal has been mined, and might not occur at all. The likelihood of subsidence depends on the size of the void and its depth below the surface; as size increases or as depth decreases, the likelihood and severity of surface subsidence increase. Other factors which play a role are the nature of the overburden (faults, etc.), surface topography, effect of ground water on sub-surface rock movement, the number of coal seams, the method and order of extractions, and the effectiveness of supports left in the mine.

The damage which subsidence can do at the surface is the same as that wrought by other earth movements. Structures of all kinds, buildings, dams and bridges, may crack or fall; highways may fill with cracks, potholes or bumps; railraod tracks may be thrown out of line; utility pipes may be ruptured; natural drainage and river flows may be affected; ground water supplies may be lost. In addition, cracks and fissures may permit surface water to seep into underground mine workings and increase the opportunity for the breathing phenomenon discussed above in connection with acid drainage. One study estimated the cost of surface damage in western Pennsylvania in 1968 at $295,000. The potential damage was 39 million dollars, although this was reduced by leaving more than four million dollars worth of coal in place to support the surface. How much damage may yet occur due to changing surface use was not predicted.[96]

Another study estimated that two million acres of surface in this country have been subject to subsidence, 99% of which overlie coal mines. Another six million acres of abandoned underground workings are potential subsidence threats. In Maryland and Ohio, occurrences have been relatively few, small and remote. In West Virginia, they also have tended to be remote, but larger and more numerous. As with so many other environmental side effects from coal mining, Pennsylvania has suffered most from this problem.[97]

One of the factors which has rendered the problem so grave in Pennsylvania is the proximity of anthracite coal mining to urban areas. When subsidence occurs in forested, agricultural or idle lands, the effects are relatively minor insofar as human suffering or property damage are concerned. More than 90% of past subsidence in the United States has been in these areas. But in the Pennsylvania anthracite region, highly populated centers abound. Mining either has gone on underneath these cities and towns, or development has proceeded over previously-mined areas. Of the 90,000 acres estimated to be affected by subsidence in the anthracite fields, 50,000 are in an urban locale.[98] Although other Appalachian coal regions generally do not have as many population centers affected, there are some which have been or are potential subjects, such as Frostburg, Maryland.

2. Control

One way to deal with subsidence is to remove all the minable coal and induce immediate collapse of the mine roof, in an attempt to clarify underground and surface conditions as quickly as possible. Although unacceptable in urban areas or wherever significant damage may ensure, in remote or forested areas this may be appropriate (if other problems, such as acid formation are not aggravated). Another technique, assuming the risk of prospective subsidence exists, is to limit its effect on surface structures by properly locating them and building them with protective features, such as reinforced foundations or leveling devices.

The traditional method of support has been partial extraction -- leaving coal in the form of supporting pillars. Artificial supports are used during active mining to protect miners from roof cave-ins, and these can have the effect of preventing early cracks in the roof which are the harbingers of later subsidence. But these artificial supports are generally inadequate for long-term purposes. Although pillars may be or have been the best we have, they also are of limited value. They are subject to weakening by natural forces, or by improper pillar robbery. Where multiple-bed mining occurs, the pillars must be properly positioned to be of significant value -- an unlikely result especially where the seams are mined at different times. Partial extraction also has the disadvantage of leaving fuel resources unmined; half or more of the deposit may be left for the supportive function. The study of subsidence in western Pennsylvania in 1968 reveals that 54 million tons of coal were extracted and 12.4 million tons left for support.[99]

Backfilling is a term applied to various methods of filling the cavity with mine wastes, sand, crushed rock or other material for support purposes. Use of wastes can ameliorate the general problem of waste disposal -- not just from mining, but also from municipal and industrial causes. But it may be impracticably expensive. Preparation plant wastes can only fill about 25% of the mine from which they come; additional fill may have to be purchased (although other wastes may be available at no cost); any fill must be transported to the mine. Backfilling also is thought to be only 50% effective at most in reducing surface subsidence.[100]

"Flushing" or "hydraulic stowage" has been the most widely used backfilling technique. It is probably the most effective and least costly. The fill material is mixed with water and pumped into the cavity through pipelines or boreholes, and the water is allowed to drain out. Significant obstacles exist in abandoned mines, because of the absence of accurate maps showing the location of older mines, inaccessibility and hindrances to flow resulting from cave-ins and roof falls and geological factors reducing flow of the material through the mine or drainage of the water out of it.

Backfilling is common in some foreign countries; for example, it constituted 11.5% of the cost of production at a typical English mine in 1963, 5% in Poland in 1958.[101]

But it is uncommon in American coal mining. Perhaps its most intensive use has been in government operations to control subsidence from abandoned mines in the Pennsylvania anthracite regions. Backfilling costs in these operations are higher than they would be if done along with active mining. Like control of many other environmental side-effects, surface support techniques are most effective and least expensive when incorporated into the mining process.

F. Fires[102]

1. Cause and Effect

The exposure of coal to heat and oxygen produces the risk of fire -- a risk which has materialized in hundreds of mines and refuse banks. The large supply of fuel and its inaccessibility make these fires difficult to extinguish either by artificial or natural means. A 1963 study discovered fires in more than one hundred abandoned underground mines and coal outcroppings, and in more than 440 coal refuse banks in the northern Appalachian Region. This included 106 mine and outcrop fires and 368 refuse bank fires in the four-state region under study here: Maryland, Ohio, Pennsylvania and West Virginia. About three-fifths of the refuse bank fires were at abandoned mines. Many of these fires had burned for years, some for decades. One fire had been burning or smoldering since 1884, foiling several attempts at extinguishment.

These fires may be caused by human carelessness or intent, by spontaneous combustion or by occurrences such as forest fires and lightning. The dumping and burning of trash is a common source of fire at old strip pits and mine openings. Spontaneous combustion often ignites refuse banks. Campfires built on or near refuse piles and even intentional burning to obtain "red dog" for fill and road and driveway surfacing have also played the ignition role. Finally, fires may spread from refuse bank to coal seam, or vice versa.

Fires pollute the air with smoke and noxious gases, perhaps their most significant side effect. They also are safety hazards and, when they occur in coal seams, they destroy coal reserves. Underground mine fires can cause subsidence by burning out support.

Three-fifths of the refuse bank fires noted in the 1963 survey were within a mile of communities of one hundred or more people. Some fires are close to large cities. In 1966, for example, some Scranton, Pennsylvania residents were forced to flee their homes when carbon monoxide ascended from an underground mine fire.

2. Control

Although a coal mine or refuse bank fire may be impossible to stop with present technology,[103] several techniques have been developed with varying degrees of success. Methods to combat mine and outcrop fires include stripping out the burning material and backfilling the pit; covering the material with several feet of incombustible matter or building an incombustible fire wall around the burning material. Methods for fighting underground fires also include construction of an underground seal or barrier and sealing surface fissures.

Refuse bank techniques have included using water to extinguish and dislodge burning refuse and transporting the cooled material to a disposal site; flooding; flushing limestone through boreholes into the pile; and covering the pile with an incombustible material such as dirt, clay or artificial sealants.

The proper control technique for fires in coal beds and refuse banks depends on the nature of the particular fire, its source and its surroundings. Relevant factors include the shape of a refuse bank; access to the site of water, other estinguishing material and equipment; the availability of a disposal site for quenched refuse pile materials; the value of the reclaimed land, and the topographical and geological context.

Perhaps most important, particularly for refuse piles, is proper planning and construction of the pile during active operations -- a condition not enjoyed by most piles abandoned in the past. Suggestions for proper design include location in an area where the fresh air supply is reduced, as in a ravine; limiting air entry and flow through the pile by not segregating sizes of refuse, by putting the refuse down in layers and compacting each layer, by crushing large pieces of refuse and by sealing exposed faces of the refuse pile with clay; diverting water from surface drainage, and clearing combustible material such as vegetation from the site. The bank should be properly graded and sealed, and cover such as vegetation added to reduce erosion. Fencing and posting notices may be necessary to warn peopl of the risk of ignition, and regular inspection and maintenance is needed.

Doing away with the refuse bank is probably the most effective way of meeting the problem. Where cost and technology permit, burial in abandoned strip pits or underground mine cavities may be appropriate.

G. Some Common Factors

The environmental side effects discussed in this chapter differ in many ways. But they also are closely related. Subsidence may contribute to acid drainage. Surface mining may clear up an acid drainage source. Backfilling may both reduce subsidence and eliminate a refuse bank as a source of drainage, erosion and fires. The severity of each problem and its control depend on the specific circumstances of each mine. Mine drainage may be highly acid in one situation, alkaline in another. Erosion and landslides may be unpreventable in some kinds of surface mining. Subsidence depends upon a variety of geological and topographical considerations. In addition, although research into abatement techniques is proceeding at an ever-quickening pace, we do not yet have effective solutions to all of the problems. Measures needed at one mine may be obsolete tomorrow. The importance of flexibility in governmental controls is apparent.

The need for accurate maps is clear -- not just for abandoned mines, but also as a readily available record of present and future operations. Also clear is the importance of incorporating control techniques into the active mining process, which suggests that pre-planning these techniques and building them into the operation is essential.

Finally, abandoned operations pose, on the whole, the most difficult and expensive problems. Operators of active mines ameliorate environmental side effects to some extent, but regulation is essential to ensure that their efforts are sufficient.

Table 3, which follows, identifies the proportional acreage affected by surface mining for coal relative to other minerals in the four subject states.

TABLE 3

ACRES DISTURBED BY SURFACE MINING BY COMMODITY, AS PER CENT OF TOTAL (1965)

	Coal	Stone	Sand and Gravel	Clay	Iron Ore	Other
Md.	8.7	8.7	75.0	4.8	x	3.2
Ohio	77.0	7.6	10.0	3.7	1.5	.2
Pa.	81.5	6.6	6.4	2.8	2.4	.1
W.Va.	98.0	1.5	.2	.2	.1	x

Source:
U.S. Dep't. of Interior, Surface Mining and Our Environment (1967).

Totals may not be 100% due to rounding.

III

COAL RIGHTS AND THE PROPERTY SYSTEM

The property system is the fundamental legal mechanism for allocating rights in resources. The system's treatment of mineral resources is complicated by the functionally changing nature of the resources themselves -- coal is a subjacent geologized stratum, but concomitantly due to its value once extracted, it can be bought and sold as a commodity. Accordingly the property system has developed a body of rules to deal with the special problems or rights in extractable minerals.

A. Rights in Coal

At the base of the mineral right structure lie two postulates: (1) presumptively, the owner of the surface also owns the minerals below;* (2) but the owner of the surface may convey the minerals, so that the ownership of surface and minerals are in two different persons. Like the surface, minerals in place are "real estate,"[105] and if severance occurs, the ownership interests created are comparable to interests in adjoining land. ("Severance" is used here to describe the split in ownership of surface and minerals, but not the extraction of the minerals.) Severance need not be by a conveyance of the minerals; it also occurs when the owner of an unsevered estate conveys the surface and reserves or excepts the mineral interest to himself. There also may be more than one mineral estate in a given tract of land, since different minerals or even different veins of the same mineral may have different owners. In some sales of minerals in place, the vendor retains the possibility of obtaining an interest in the minerals at some future time; he also retains an interest in the mined-out area after the mineral is exhausted.[106]

The owner of the minerals may extract them himself, whether or not he also owns the surface. If severance has occurred, the mineral owner usually is protected by express or implied rights to use the surface to the extent necessary for mining, preparation and waste disposal, and the surface owner is ensured a right of support (although this has frequently been waived in the deed). The question whether stripping rights can be implied from a general grant of mining rights will be discussed in the next chapter.

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* According to the ancient common law maxim: Cujus est solum, ejus est usque ad coelum et ad inferos. (To whomsoever the soil belongs, he owns also to the sky and to the depths.)[104]

Although the mineral owner may engage in extraction, he often bestows this privilege on someone else. The labels applied to operating rights short of outright sale vary considerably, as do their nature and consequences. They may be profits, easements, licenses, or leases, for short terms or long, for minimum royalties or not. The most common form is the lease. One writer has noted: "Coal leases are so different in their characteristics that no general definition can be formulated which will include all possible and desirable features.[107] Still, some generalizations can be made. The lease usually grants the right to mine for a specified period of time in return for a stated royalty (payment per ton mined or sold) with a minimum annual royalty often required. The lease usually also contains clauses concerning development and marketing, use of the surface, surrender or forfeiture, and termination by the lessor.[108]

Although the old coal leases were often for indefinite terms (e.g., until all merchantable and mineable coal is mined) or for long terms (e.g., 99 years), by 1915 the typical term was rarely more than 20 years.[109] Modern leases typically are for a fixed period with right of renewal, subject to earlier expiration upon exhaustion of the coal which is commercially mineable and merchantable.[110]

Many words have been shed over the distinction between a lease and an outright sale. According to one writer:

> "The basic function of a coal
> lease is to provide a means
> whereby the owner of the coal

> may procure its extraction and sale upon a deferred purchase money basis at a price usually far greater than could be obtained on a sale in gross or by the acre. Ordinarily non-corporate owners of coal are incapable of financing the erection and operation of elaborate and costly production facilities. On the other hand, the lessee usually desires to pay for the coal as and when it is mined, financing the cost out of the proceeds of the sale of the product."[111]

But clauses providing for periodic compensation and a limited term, commonly associated with the lease, have not precluded a judicial finding that a document represents a sale. The "Pennsylvania doctrine" is the most extreme in this regard. As described by the Pennsylvania Supreme Court in 1959, the test of a sale of coal in place is:

> "(1) the right had to be exclusive in the vendee; (2) to mine all the coal; (3) and he must have paid either a stipulated consideration, or have been compelled to mine or what is the same thing, pay for all the coal if not mined "[112]

The third qualification need not be express, since the law implies "a covenant to mine and remove the coal with due diligence" if the agreement is silent on this point.[113] Typically, however, coal leases specify the lessee's duty of development, particularly by requiring payment of a minimum annual royalty.[114] Such a provision satisfies the third condition.[115]

The net effect of a sale is to transfer title to the coal in place to the vendee; the lease leaves title in the lessor. But although the purchaser has title to the coal, his interest under the Pennsylvania doctrine may be quite limited. In one case, the amount of time he had to extract the coal was only ten years. Despite the fact that the transfer in that case constituted a sale, the purchaser was not entitled to remove the coal after the term ended. His "fee simple" estate in the coal was determinable, with the ten-year term constituting the limitation. The vendor's "possibility of reverter" in the coal materialized when the term ended with coal remaining; the vendor was then re-vested with his estate in the coal.[116]

The sale-lease distinction has been important in the past because of the different interests each method of transfer creates in the parties involved. This has affected such questions as the passage of the interest on death, whether excess royalty payments can be set off against future obligations after a renewal of the agreement, whether the lessor-vendor has an interest subject to execution, tax liabilities and adverse possession.[117] Most important for present purposes is the principle that a leasehold interest may be lost by abandonment, whereas a fee simple interest may not.[118] When the fee simple is limited by time, as is possible under the Pennsylvania doctrine, the distinction is of little significance once the term has ended; whether created by sale or lease, the lessee-vendee's interest will terminate at the end of the period. The same is true where exhaustion of the minerals, without more, terminates the lessee-vendee's interest. But if neither of these factors is present, the vendee may still have an interest in any remaining coal in the mine if his interest was created by sale, whereas the lessee may have surrendered his interest by abandonment if created by lease. The test of abandonment in this context is an intention to give up the rights involved, combined with acts (or a failure to act) reflecting that intent. Thus, in Chandler v. French, the lessor was held entitled to all the minerals previously leased when his lessee failed to begin mining for a reasonable time (four years there) after the date of the lease.[119] Aside from abandonment, the sale-lease distinction arguably is relevant to the liability of the lessor-vendor. This will be discussed in the next chapter.

Refuse discarded by the miner initially belongs to him as personal property. However, this is capable of being abandoned, and the intention to discard which is commonly associated with refuse makes a finding of abandonment likely.[120] This refuse may become the property of the surface owner through appropriation or accession. Disputes here have centered around who is entitled to minerals of value which have been discarded along with other refuse.[121] The sale-lease distinction is not of importance.

Note also should be taken of the rights of surface owner and mineral owner or lessee in the cavity created by mineral extraction. Disputes here have centered primarily around use -- for example, the right to use the passageway to carry minerals extracted from adjoining property. In the absence of agreement to the contrary, the mineral owner (but not the lessee) retains the right to use the cavity, at least as long as the minerals are not exhausted and he has not abandoned the mine. The courts are divided on the limits to the mineral owner's interest. In any case, although there have been suggestions to the contrary, it seems clear that upon exhaustion of the minerals the cavity is "owned" by the surface owner.[122]

B. Survey of Ownership Patterns

The various ways in which the property system can allocate coal rights has now been sketched. In order to discern the actual pattern of surface and mineral right ownership a survey of government and company officials in Maryland, Ohio, Pennsylvania and West Virginia was conducted. Although detailed statistical information proved unavailable a general picture can be developed from the responses.

As might be expected, coal mining historically has been done chiefly by operators who did not own the surface. Their mineral interests have taken the form either of fee title or leasehold; the former constitutes a significant proportion, particularly where the Pennsylvania doctrine of identifying sales is followed. Thus, it was suggested that most coal mines in western Pennsylvania were owned and operated by someone other than the surface owner. This could be expected because, until World War II, most coal mining was done underground, and control over the surface was necessary only to the extent required for the mining and processing operation -- for construction of shafts, access roads, and processing plants, taking timber for supports, refuse dumps, etc. This control was obtained through express or implied rights in the deed or lease, and purchase of more of the surface was unnecessary. Moreover, in some instances mineral rights could be acquired quite cheaply from surface owners who wanted to continue their own use for residential or agricultural purposes but had little interest in or knowledge about the hidden wealth below.[123] Another factor contributing to mineral severance was the expedient of reserving or excepting mineral rights whenever land was sold, a common practice in such areas as western Maryland.[124] The vendor of the surface may not have known whether minerals existed in his property but he wanted the windfall if they did. If minerals were found he would usually sell or lease the minerals to a company which had the capital or expertise to extract them.

Even where strip mining was contemplated, purchase of the surface was not particularly common until very recently. In those states where mineral deeds were liberally construed to give stripping rights, purchase of the surface was unnecessary if the minerals could be or had been acquired without it. If the surface owner's consent had to be obtained to rip open the land, a royalty payment often sufficed.

Today it is more common to find coal operators purchasing both surface and mineral rights. More coal is mined by stripping, and operators are finding that reclamation (whether legally required or not) can produce land valuable for other purposes when mining is completed. In relatively flat areas, for example, some coal companies are turning reclaimed lands into farms or pastures. Purchase of the surface also relieves the mine operator from the aggravation of dealing with the surface owner.

As coal operators find it more appropriate to purchase the surface, surface owners are becoming less interested in selling. Where the surface is desirable for the non-mining uses to which it may be put, and reclamation is required, both coal operator and surface owner may wish to seize the advantage. This has been mentioned particularly with regard to such areas as western Maryland, where the land has increasing value for recreational purposes. The surface owner still profits from the coal, at least if strip mining is done, since he may require a royalty for use of the surface during mining operations. When mining is desired in areas already devoted to valuable surface use, such as residences, it also has been difficult for operators to acquire surface rights because of the acquisition costs.

A related question is the degree to which owners of severed mineral rights lease the operating rights to a third party, and the degree to which lessees sub-let their operating rights. The officials surveyed believed such leasing or sub-leasing has been relatively uncommon. Typically, the lessee or the owner of severed mineral rights operates the mine himself.

Implicit in these findings is that history and geography affect the extent to which ownership or operating rights have been separated from the surface. The old transfers and transfers in areas where stripping was unlikely often created severed interests.

C. Requirements of Owner's Consent for Governmental Activities

One of the obvious problems that the diffusion of ownership rights in coal present to administrators seeking to abate mine drainage or to reclaim surface areas is that it complicates procurement of the requisite consent of the owners.

The kind of consent needed depends on the kind of rehabilitation proposed. It may merely take the form of protection against future claims of trespass --

for example, where entry is needed to determine the source of acid drainage, the condition of a mine or refuse bank, or monitoring and maintenance activities, and such entry is not authorized by statute.*

The agreement of the owner or possessor of the surface, the mine or adjoining land may be needed for entries of a more permanent or traumatic nature -- for example, construction of access road, drilling, removal of timber, earth-moving and perpetual access rights for inspection and maintenance.[126]

Finally, acquisition of more substantial property interests may be necessary -- for example, where the government wants to construct a treatment plant or build a park. The surface is primarily of concern in these cases, although it may also be appropriate to acquire mineral rights.

Where property interests such as easements and fee title must be acquired, eminent domain powers may be called into play. If owners are unknown, damages may typically be paid into court and the acquisition consummated. But these formal procedures may be more cumbersome than private negotiations with the owners.

Many of the officials contacted in the survey thought that identification of owners of mining properties is not generally very difficult through title records, and tax records in particular. In situations where owners have left the land, unpaid taxes have often resulted in tax sales which re-established title in an identifiable person. Nearby owners and possessors often can supply relevant information when the records are incomplete.

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* Some statutes do authorize such entries, e.g., W.Va. Code Ann. sec.20-7-4(1970). Even statutory authority cannot prevail over the Federal Constitutional admonition against unreasonable warrantless searches. But this prohibition would seem to be inapplicable to inspection of open lands, as would typically be involved here. As Justice Holmes said, "the special protection accorded by the 4th Amendment to the people in their 'persons, houses, papers and effects' is not extended to the open fields."[125]

Still, many instances do occur where responsible individuals cannot be found. Some pollution abatement officials complained of delays of up to two years in finding owners. These delays usually occurred in connection with rural lands which were abandoned by their owners years ago, with no intervening tax sales to re-establish ownership. Since remote lands often are of little surface value, particularly if strip mined, the absence of a tax sale is not hard to explain.

Hence the problem of procuring consent for abatement and reclamation work appears primarily a matter of delay. In most instances property records are sufficient to determine the owners of surface and coal rights. Even in those instances where the property system has so broken down that owners cannot be found, the government may resort to a tax sale to clear title. But in either case there is slippage in the system. Negotiation, condemnation procedures, tax sale -- all consume time that may impede the desired abatement or reclamation schedule. This has led to the suggestion that summary procedures be statutorily developed which permit government agencies timely access, but at the same time protect the land and coal owners against the taking of or damage to their rights through prior escrow payments into court.

The property system has developed an elaborate calculus for allocating rights in coal and coal lands. The patterns of ownership which have developed under the system are diffuse and dynamic, with a present trend toward combined ownership of coal and surface rights in mine operators. Breakdown in the system which makes it difficult to determine private ownership rights on occasion have delayed government efforts to remedy side effects from coal mining. Other consequences which follow from the various ownership patterns are developed in the succeeding chapters.

IV

COMMON LAW RESPONSES TO COAL MINE SIDE EFFECTS

Law suits are the historic method for resolving disputes over the use of resources. Coal mines have created such disputes with reference to both water quality and land use. Contestants are characteristically the mine operator on the one hand, and an owner of neighboring land, the owner of surface rights of the coal land, or a governmental body on the other.

A. Water Quality

Coal operations produce acid mine drainage. This drainage has a deleterious effect on receiving waters manifested by increases in acidity, hardness, iron and manganese. At common law, courts used the property system and the doctrine of nuisance to resolve the resulting conflicts. Each owner of land abutting stream water was said to have a riparian right to use such water so long as he did not interfere with its reasonable use by other landowners. It was said to constitute an actionable nuisance for anyone to make discharges into a stream which would interfere with its reasonable use by others. But a rule of "reciprocal reasonable use" is too high on the abstraction ladder to be of much help in actually predicting how disputes will be resolved.

The actual working of the system is better illustrated by examples from the four subject states. The Pennsylvania experience provides a good illustration of changing values and judicial adaptation. In the notorious 1886 case of Pennsylvania Coal Co. v. Sanderson, the Pennsylvania Supreme Court displayed the classic "robber baron" mentality. In response to a complaint by a downstream landowner of acidic water, dead fish and corroded pipes the court said:

> "...The defendants were engaged in a perfectly lawful business, in which they had made large expenditures, and in which the interests of the

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> entire community were concerned. They were at liberty to carry on that business in the ordinary way, and were not, while so doing, accountable for consequences which they could not control. As the mining operations went on, the water, by the mere force of gravity, ran out of the drifts, and found its way over the defendant's own land to the Meadow Brook. It is clear that for the consequences of this flow, which, by the mere force of gravity, naturally, and without any fault of the defendants, carried the water into the brook, and thence to the plaintiff's pond, there could be no responsibility as damages on part of the defendants...."[127]

The court has been in rhetorical retreat ever since. In 1913 the Sanderson rule was viewed as an "extreme exception to the general rule" and held not to apply either to mine water pumped to the surface, or to discharges into otherwise unpolluted streams.[128] In 1924, Pennsylvania R. Co. v. Sagamore effectively dispensed with the Sanderson rule by determining that:

> "No language used in that opinion can be tortured with an indication that waters of the commonwealth can be polluted by its mines where the public is affected....It has always been under our law a nuisance to pollute a stream from which the public gets its water."[129]

Since as a practical matter virtually all flowing water is subject to public use, Pennsylvania seems to have joined West Virginia and Ohio in a case law which nominally makes coal producers financially responsible for impairing the quality of stream water. Ohio law is exemplified by the case of Straight v. Hover. There the defendant separated salt water from oil extracted on his land. He allowed the salt water to run off and pollute a stream. When sued by plaintiff, he argued that he was using the most modern technique available and still could not prevent the run off. In addition, he claimed that the stream was part of the natural drainage basin of the area and that such run off was therefore inevitable. The court answered:

> "However numerous may be the persons who engage in mining for coal and petroleum, however laudable may be their undertakings, these are but private enterprises instituted and conducted for private gain which may be acquired only with due regard to the rights of low proprietors...."[130]

The West Virginia attitude is mirrored in Day v. Louisville Coal & Coke Co. There the defendant had deposited large quantities of tailings and other waste in a stream that was washed down onto plaintiff's land. Aside from rendering the stream unfit for agricultural and domestic uses, the mine refuse also covered 60 acres of plaintiff's farmland and 40 acres of bottom. The court rejected the miner's contention that a verdict against mining would be "subversive of great public policy." The court equated the maxim Sic utere tuo ut alienum non laedas* with the Golden Rule and said:

> "If one up the stream in his work, be they ever so lawful, honorable, and necessary for

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* "Use your own property in such a manner as not to injure that of another."[131]

> private weal, so thereby injure the land of that owner further down by unlawful invasion of it, by casting upon if things damaging it, or by polluting the purity of its waters, rendering it unfit for the owner's consumption as it passes through his land, the man up the stream must answer in damage."[132]

Maryland alone among the four states has no cases dealing with the financial responsibility of coal operators for mine drainage. But general language from related cases would seem to put it in line with Pennsylvania, West Virginia and Ohio. In Jessup and Moore Paper Co. v. Zeitler, where a paper mill polluted a stream interfering with farm operations downstream, the Maryland Court of Appeals said:

> "The right of riparians to the enjoyment of a stream in its natural flow, quantity and quality has long been recognized as a fundamental principle of law. Every riparian owner is bound to use this common right so as not to interfere with an equally beneficial enjoyment of it by others."[133]

There are at common law a variety of legalistic doctrines which may limit the mine operators responsibility. Some courts have distinguished between underground streams and percolating waters. Pursuant to the so-called English Rule, while landowners are limited to a reasonable use of underground streams they have absolute ownership of percolating waters (water oozing or seeping through the soil without a defined channel). Application of the English Rule could preclude recovery for acid contamination of water oozing next door.[134] Pennsylvania adheres to the English Rule, but courts in Maryland, Ohio and West

Virginia have adopted the so-called American Rule (limitation to reasonable use of percolating waters).[135]

In addition arguments are sometimes made that a right to pollute can be acquired through long usage, and that use of the best engineering techniques available to avoid pollution functions as a defense.[136] These arguments have met with little, if any, success in the four subject states.

B. Land Use

Coal operations create two typical forms of land use problems. Early disputes involved responsibility for cave-ins. More recently, development of sophisticated surface mining techniques has created questions as to the responsibility for slides and topples.

Common law has responded to these problems in two ways. First, to the extent some privity relationship can be established, the conflict may be resolved by construction of the agreement between the disputants. For example, if the owner of a parcel of land (or his predecessor in title) transfered mineral rights to the coal operator (or his predecessor) the correlative rights of the parties may be established by interpreting these conveyances. Second, in the absence of a privity relationship (or in the absence of any manifest expression of intention in the conveyance), the conflict may be resolved according to common law doctrine.

1. Deed Interpretation

Most of the problems of interpretation relate to conveyances severing the coal rights from the surface rights. The disputes have centered around whether owners of mineral rights are entitled to take coal by strip mining.

In the early 1900's in Appalachia severance of mineral rights from surface rights was wide-spread. Since at that time surface mining had little currency, the conveyances employed did not explicitly deal with the eventuality. Hence, there have been recurrent disputes as to whether the general language used authorizes surface mining. The problem is particularly acute since deep mining may be compatible with agriculture or residential use while strip mining decimates the surface.

Nominally, these disputes are resolved according to the intention of the parties as manifested by the language of the conveyance. But interpretation of these "broad form" deeds has varied from state to state. West Virginia was the first state to deal with this problem. In West Virginia-Pittsburgh Coal Co. v. Strong, decided in 1947, the coal operator had rights to:

> "...enter upon and under said land with employees, animals and machinery at convenient point and points, and to mine, dig, excavate and remove all said coal, and to remove and convey from, upon, under and through said land all said coal and the coal from other land and lands and to make and maintain on said land all necessary and convenient structures, roads, ways, and tramways, railroads, switches, excavations, air shafts, drains and openings, for such mining, removal and conveying of all coal aforesaid, with the exclusive use of all such rights of way and privileges aforesaid, including right to deposit mine refuse on said land and waiving all claims for injury or damage done by such mining and removal of coal aforesaid and use of such privileges."[137]

The court determined that this language did not give the operator the right to strip mine and the landowner retained the right to the surface undisturbed.

The Ohio Court of Common Pleas was confronted with the problem in 1954. There the conveyance granted to the coal operator rights

> "...of ingress, egress, regress and of way and other necessary or convenient rights and privileges in, upon, and over the above described premises for the purpose of mining, removing, developing, boring for, refining and taking away said coal, oil, gas or any other minerals contained therein or thereon. Also the privilege of removing under and through the same any oil, gas, coal or other minerals which are owned by or which may be hereafter acquired by the said grantee herein without being in any way liable for damage or injury which may be done to the above described premises or to any waters or water course therein or thereon, by reason of the mining, removing, and taking of said coal, oil, gas or other minerals."[138]

And the court determined that surface mining was not authorized.

In 1953 the Pennsylvania Supreme Court faced the same problem. In Rochez Bros. Inc. v. Duricka, the conveyance gave the coal operator:

> "...the right to mine and carry away all of said coal, and with all the mining rights and privileges necessary or convenient to such mining and removal, draining and ventilating of the same, and without being

> required to provide for the support of the overlying strata, and without liability for injury to the said surface or to anything therein or thereon by reason of the mining and removal of all of said coal or the manufacture of the same or other coal into coke, or other products, at such places as may be selected by said second party, its successors or assigns."[139]

The Pennsylvania court likewise decided that this grant did not authorize surface mining. In reaching its decision the court noted that the surface estate was used as a farm and:

> "The farmer may plough, plant and prune while miners work underneath his growing crops. But strip mining drives him from his fields as effectively as a tornado."[140]

Subsequent cases broadened the base of this decision by emphasizing that "the utility of quality of the land involved is not a determinative factor" and, in view of the surface destruction wrought by strip mining, the burden rests on the person who wants to perpetrate this violence "to show some positive indication that the parties to the deed agreed to authorize practices which may result in these consequences."[141]

But the opposite conclusion is just as readily reached. The Pennsylvania court in 1954 was faced with the following language:

> "...all the coal, oil, natural gas, and other minerals, in and under the surface of said land; together with the exclu-

> sive and perpetual right of ingress, egress and regress into and upon said lands, to examine, search for, mine, manufacture and prepare said coal, oil, gas and other minerals for market; to take, remove and transport the same therefrom as well as coal, oil, gas and other minerals from other lands; to build and construct shafts, drafts, air shafts, bore holes, gangways headings, roads, and drains in, through, upon and under said surface; to pump water from the mines and run same on said surface; to locate and erect such fans, engines, machinery, buildings, shafts, drafts and other structures, with the necessary curtillage, as may be necessary for the convenient use, ventilation and working of the mines and works appurtenant thereto and to manufacture coke; to use sufficient and convenient portions of surface to deposit dirt and waste from the mines, and for the location and erection of miners' dwellings, tenements, offices, stores and other buildings; without any liability whatsoever for damages to said lands or for injury to or diversion of waters flowing in through, under and upon said land."[142]

It determined that the owner of these mineral rights was entitled to strip mine, emphasizing that the coal could not be extracted by any other method. It distinguished the previously discussed Rochez case on the basis of the differing language and on the grounds that in Rochez rich agriculture land was involved while here the surface was mountainous and had been acquired by the state at a nominal price. As suggested above, however, later cases de-emphasized the latter factor.

In 1968 the Maryland court was faced with this recurrent problem in Department of Forests and Parks v. Georges Creek Coal & Land Co.. Here the coal operator had rights to:

> "...all the coal, clay and other minerals, and all the oil and gas underlying said land hereby conveyed, together with the right to enter in, upon and under said land and to mine, excavate and remove all said coal, clay and other minerals, and said oil and gas, and to transport and haul the same to market; and also the right to enter in, upon and under said lands and to transport and haul the coal, clay and other minerals and the oil and gas from other lands and under and over and across said land; and also the right to enter in, upon and under said land and to make, construct and maintain road ways, excavations, tunnels, drain ways, tracks, pipe lines, power lines, tipples, and any and all other like structures and to do any and all things necessary or convenient for the mining and removing of said coal, clay and other minerals and said oil and gas and the coal, clay

> and other minerals, and the oil and gas from other lands; and also the right to enter in, upon and under said land and to construct and maintain poles, towers and wires and other like equipment for carrying electricity for any purpose whatsoever; all without being in any manner liable for the breaking or subsidence of the surface of said land or for any injury or damage to the overlying surface thereby or to anything therein or thereon by the exercise of the rights hereby excepted and reserved, whether or not the same be caused by or due to the negligent manner in which said mining operations are conducted or said rights are exercised."[143]

The Court determined that these rights included the right to surface mine. In mitigation of the Maryland result is the fact that, as the court pointed out, the conveyance in question was made after rudimentary efforts at surface mining were in practice and explicitly authorized "excavation," thereby leaving the door open for an opposite result when faced with an older or less explicit conveyance.[144]

In this potpourri of cases the intention of the parties creating the mineral rights seems for the most part illusive. Since the severances typically occurred before surface mining techniques had become prevalent the language is not written with these techniques in mind, but the language used is typically generic and abstract enough to embrace any coal-taking operation. Hence, differing intentions can be extrapolated depending on the point of departure, leaving a good deal of room for judicial predilection and policy-making. The West Virginia, Ohio and Pennsylvania courts have proved predisposed towards surface preservation, although the Pennsylvania courts have vacillated. The Maryland court in the one case presented to it favored the mine operators prerogative.

2. Common Law Doctrine

There is more hard law relating to the responsibility of miners for operations which result in cave-ins or landslides. As illustrated in the quotations from the deeds above these problems too may be dealt with by agreement. Correlative support obligations can be expanded or contracted through agreement.[145]

For the most part, however, support disputes are resolved by common law doctrine. The common law of all four states begins by stating that landowners have a right not to have their land toppled because of excavation on adjacent tracts (lateral support) nor to be collapsed by virtue of undermining (subjacent support).[146] All four states have on occasion imposed financial responsibility on operations which have so flawed the geological make-up of nearby land. The flaws have varied from sink-holes, to fissures, to landslides, and liability has been justified on the theory that mine operators are liable without any demonstration of fault if it can be proved that their operation impaired the integrity of the soil.

Responsibility of mine operators becomes more problematic when the surface owner seeks to recover for damages to buildings. Several generalizations can be made from a rather inconclusive and inconsistent body of case law. First, in all four states the courts have said that artificial structures are not entitled to the same absolute right of support extended to soil in its natural condition.[147] Second, the courts appear more inclined to protect buildings from damages resulting from cave-ins than from damages occasioned by surface excavation. This inclination is expressed in various ways: in Pennsylvania and West Virginia by decisions which, despite protestations to the contrary, provide a functionally unlimited right to subjacent support for buildings;[148] in Ohio by a rule which makes coal operators prima facie liable for undermining buildings (such liability only to be avoided by a showing that the subsidence would not have occurred but for the weight of the building);[149] in Maryland by a case that creates a presumption of negligence where a building is undermined as a result of deep mining.[150] If these special doctrines fail to justify imposition of liability then the operator of the deep mine is still potentially liable under tort law for negligence.

Negligence is likewise used to determine liability for surface excavations which damage buildings. Under ordinary tort principles the question would turn on whether the mine operator was using reasonable care (complying with established engineering standards) in making the excavation. Comment 819(f) to the Restatement of Torts tries to particularize by listing conduct that under some facts and circumstances may justify liability:

> "...it may be negligence: (1) (1) to excavate sand, gravel, loam, or other friable soil otherwise than in sections; (2) not to furnish temporary support by shoring; (3) to fail to give timely and sufficient notice of the proposed excavation; (4) to maintain an excavation under such conditions or for such a length of time as to expose the adjoining lands with artificial additions to unreasonable risk of harm as by exposure to rain, frost, or weathering; (5) to make use of improper instrumentalities or improper use of proper instrumentalities; (6) to employ incompetent workmen; (7) to neglect to ascertain in advance whether the excavation as planned is likely to expose adjoining lands with artificial additions to un-

> reasonable risk of harm...."[151]

Not surprisingly the courts have applied these broad theorems with varying results. Maryland courts have determined that merely leaving an excavation open for several months constitutes negligence, while Ohio courts have decided that it does not;[152] West Virginia courts have decided that failure to build a retaining wall when excavating a 45 degree slope justifies a finding of negligence, while in Pennsylvania the court has expanded the negligence notion to include excavations which could reasonably have been anticipated to impair a neighboring building (even if correct engineering procedures are used).[153] Ohio has removed some of these vicissitudes with a statute which makes excavators absolutely liable for all damages resulting from excavations greater than nine feet.[154]

The discussion so far depicts a static body of law with prescribed rights of subjacent and lateral support mutable only by agreement of the holder. This is not really the case. The common law also has built-in leeways which courts may use to make support rights correspond to changing catacombs of coal. These leeways are the doctrines of limitations, waiver and implied easements.

The doctrine of limitations may modify support rights. For example, in a turn-of-the-century Pennsylvania case a cave-in was caused by a mine operator's failure to leave sufficient pillars for support. The court found that the surface owner had lost his right to recover damages as a result of his failure to bring suit within six years (the Pennsylvania statutory period of limitation).[155]

The doctrine of waiver is well illustrated by the Ohio case of Rush v. Sines Bros. & Co.[156] In that case, the owner of the fee conveyed all coal under the land and the right to remove it. When a cave-in subsequently occurred, the transfer was treated as constituting a waiver of the grantor's support rights, since coal had been mined previous to the transfer and all that remained at that time were pillars, ribs, and stumps. In Maryland, on the other hand, a deed which conveyed "all the coal" was held not to constitute a waiver of support rights.[157]

Just as the notion of waiver may be employed to dispense with support rights by implication, implied easements may be used to create support rights. For example, in the Pennsylvania case of Durante v. Alba[158] the court has held that where a landowner divides a tract and conveys a portion of it with a building on it, retaining ownership of rest, there arises an implied duty of lateral support for the building as well as the soil. Dicta in a West Virginia case also supports the creation of an implied easement in this fashion.[159]

C. Allocation of Responsibility

The discussion in this chapter has up to this point developed the substantive bases of imposing legal responsibility for injurious side effects from coal mines. It has assumed without specificity that if responsibility is imposed, it will be imposed on the mine operator. In so doing it has skirted a troublesome issue. As detailed in Chapter III, there may be a number of persons who have a stake in the coal taking operations -- owners of the surface rights, lessors of coal rights, and mine operators. Hence all of these persons face the potential of liability.

Perhaps the best way of approaching these polycentric possibilities is to focus on one coal mine side effect -- acid drainage. If acid drainage is deemed to be a wrong for which a remedy is available, the primary person responsible is the perpetrator of the wrong -- the operator of the mine which is the source of the acid drainage. If the operator has entered under a lease or is the owner of a severed mineral interest, the question arises whether the lessor or surface owner also is responsible. Few cases have considered this problem, and none appear to have arisen in the acid drainage context.

Under general leasehold principles, a lessor in Maryland, Ohio and Pennsylvania is not responsible during the tenancy for wrongs committed by his tenant, unless he has participated in the wrong or has supervised or retained control over the tenant's activities.[160] Although it is not uncommon to find that a lessor of minerals has retained in the lease a right of inspection of the operation and of records, this has been interpreted in Pennsylvania to be outside the bounds of the control required to impose liability on the lessor. The inspection provision was viewed as serving to protect the lessor's royalty interest and other rights, such as any right he may have to surface support.[161]

Arguably, the continuous receipt of benefits by the lessor in the form of royalties justifies imposing liability on him for harm resulting from the conduct producing the royalty, at least where those harms are reasonably foreseeable and the lessor makes no attempt to limit them in the lease. The West Virginia Supreme Court followed this path in a 1965 case where a lessee strip miner dumped spoil down a hillside, clogging a stream and causing intermittent flooding of plaintiff's land. The court pointed out that the spoil could have been piled at the mine site, although this would be more expensive than pushing it over the side. There was no evidence that the lease restricted the lessee, and the court held the lessor jointly liable with the lessee. The court emphasized the lessor's receipt of royalties and rejected his contention that he had no connection with the actual operation.[162] This result seems particularly appropriate since the lessor is likely to have a continuing connection with the land, whereas the miner may depart before suit is brought (as apparently happened in this case). The lessor can take his risk into account in determining an acceptable royalty and in the terms of the lease. Other courts have taken a step in this direction by imposing liability on a lessor when the harm would necessarily result from the lessee's activities,[163] but the West Virginia court has gone the farthest of the four states examined in this study.

One would suspect that the owner of a severed surface interest would be more insulated from liability than the lessor, and the absence of cases dealing with the surface owner's liability or even involving surface owners as defendants would seem to attest to this. Here too, however, the fundamental question is whether there is anything in the relationship between the surface owner and the mine operator or his activities which justifies imposing the liability on the former. Under the Pennsylvania definition of mineral sales, the position of the surface owner may be quite similar in fact to the position of the lessor in a state which does not find a sale as easily. Thus, it is not surprising that the Pennsylvania Supreme Court, in a case dealing with a surface owner's liability for subsidence over an adjacent mine caused by the operator's negligence, stated that it was irrelevant whether the minerals were sold or leased -- the position of the surface owner was the same. He was not liable in that particular case because of his lack of participation in the wrong.[164]

The lessor or surface owner may be responsible under a duty stated independently of the tenant's commission of the wrong. For example, an Ohio public nuisance statute has been construed as speaking directly to landowners, including lessors. The owner cannot insulate himself from liability by giving possession of the property to someone else.[165]

The liability of a vendee for nuisances existing on the land at the time he purchases property, is a closely related issue. Under general principles, the fact that the vendee did not create the condition does not preclude his responsibility for it. He may be held liable, at least if he takes possession, the condition is abatable, and he has had a reasonable opportunity to discover it. A similar responsibility attaches to the lessor after termination of the lease during which the harmful condition was created.[166]

These general principles pose significant difficulties when applied to inactive mines. Few such cases have been decided. The rare example is a subsidence case presented to the Illinois Supreme Court in 1964. In that case, the Stonington Coal Co. had owned the mineral estate in the land involved and had mined part of it before 1916. In that year, Peabody bought the mineral estate, without assuming any liabilities. The surface was a farm. Many years later, subsidence created a depression in the surface which filled with water, resulting in crop loss and a reduction in the value of the farm. Stonington had long since been dissolved, and the plaintiff sued Peabody. The court decided that Peabody was responsible for subsidence over areas which it mined itself, but not for subsidence over the area mined by Stonington and left untouched by Peabody. The court noted the lack of decisions in a mining context pertaining to the vendee's liability for harmful conditions created by a previous miner. It commented:

> "Mining companies have flourished and died. No assets remain and there is nothing remaining except the old coal passageways under the ground. Another company owns whatever rights to mine coal the original company once had. As in this case, in many instances forty years or more have gone by since the last active mining operation."167

The court believed imposing liability on the purchaser would discourage the acquisition and mining of previously worked mines, an unfortunate result where modern machinery and techniques make possible the recovery of previously inaccessible coal. Moreover, the liability for removal of support is absolute, and there is nothing the purchaser can do to restore it if insufficient pillars were left by the previous miner. On the other hand, the court said, purchasers of the surface can discover whether mining has been done under the property by examination of title records and recorded mine maps, and take the risk of subsidence into account in negotiating the price.

The court's position is not without its difficulties. It places much reliance on the ability of the surface purchaser to ascertain the existence and extent of mining beneath the surface, which depends largely on the accuracy and existence of mining maps. Illinois may have a sufficient system, but the absence of adequate maps for older workings in other states is notorious -- a problem not only for purchasers but for abatement officials as well. A mining company purchasing the mineral estate would appear to be in a much better position to evaluate the adequacy of existing surface support (a very difficult problem, to be sure), and to bear the cost of insuring against this risk.

The result reached by the Illinois court is consistent with the Restatement of Torts position on the issue, as well as a 1901 Pennsylvania case which involved somehwat similar facts.[168]

To the extent these cases reflect a desire to protect mine purchasers from liability for acts of their predecessors, they apply as well to situations such as acid drainage. This is particularly true of the policy of encouraging purchase of partially mined mineral estates so that the remaining mineral can be exploited as new extractive devices are developed. But there are also distinguishing characteristics. It may be impossible to stop formation of the acid drainage, but the drainage can be treated. If new mining is going to be done, water quality standards will probably require such treatment anyway.

A more difficult problem is what to do when ownership of acid-forming material reverts to a surface owner or lessor after mining is terminated and the mine is abandoned. Encouragement of mineral exploitation is not at issue in these situations. One might argue that the risk of acid formation could have been taken into account by the parties when they made their sale or lease arrangement. But it seems clear that such is not usually the case. In light of the massive cost of treating or abating acid drainage, it is inappropriate to impose such a burden on the surface owner or the lessor, at least without clarifying his responsibility in advance.

D. Evaluation

Based on this smattering of authority private common law litigation would seem to provide a vehicle through which coal operators could be called to task for coal mine diseconomies -- acid drainage, sediment, subsidence and surface scars. It would seem that coal operators would abate and reclaim to foreclose financial liability. But this has not come to pass. Ten thousand five hundred miles of Appalachian streams are polluted by mine drainage. The area primarily affected has remained unchanged for 50 years.[169] New technology has resulted in the stripping and augering of expansive surface areas.

Several reasons may be discerned as to why private litigation has failed to make coal operators internalize the full cost of their operation. First, in many instances there is a dearth of plaintiffs. At the turn of the century many owners of Appalachian land sold to coal companies their right to complain of subsidence and surface scars. The value of Appalachian land is low, the cost of sealing deep mines and grading surface mines is high. Hence, plaintiffs often find it not worth their while to bring suit and even if they do, their stake is too small to make it economically worthwhile for the coal operator to internalize costs. Moreover, 78% of the acid drainage comes from inactive mines.[170] A preponderance of these inactive mines are "orphaned" -- abandoned by previous operators. The courts for the most part have proved unwilling to impose liability on persons other than the actual mine operator (i.e., owners of the surface, or lessors, or predecessors in title to the coal rights). Once the mining has stopped it is difficult to find the operator in a state of financial solvency.

In addition, there are other inherent limitations on the efficacy of litigation.[171] Adversary proceedings are cumbersome. Lawyers and courts are expensive. The wide diffusion associated with coal mine diseconomies makes it hard to bring a single suit for full damages. The leeways of the legal process make results difficult to predict, thereby increasing the risks of litigation.

V

STATUTORY RESPONSES TO COAL MINE SIDE EFFECTS

The inability of the common law to control the environmental degradation of coal mining resulted in legislative intervention. The intervention was either directed at mining or covered mining as part of a more general attempt at protecting environmental quality. It appeared primarily at the state level, but was joined by local ordinances in some cases, by interstate compacts and, more recently, by Federal legislation. This chapter will describe the more important responses. Brief mention will be made of responses by local governments and interstate compacts. For ease of comparison, tables depicting the overall pattern of legislation in the areas of water quality and strip mining have been prepared and are presented as Tables 4 and 5 . The text describing developments in these areas uses Pennsylvania as the major example, in part because some of its solutions are typical, in part because it has gone farther than other states in atttacking the problems under consideration.

A. Water Quality

Each of the states involved in this study has a comprehensive water pollution control statute, defining prohibited discharges, authorizing the establishment of water quality standards, and providing for administrative supervision and enforcement.[172] Each statute purports to limit mine drainage either expressly or within the confines of more general definitions.[173] But acid drainage is a relative newcomer to the list of prohibited effluents. The historical reluctance of legislatures to deal with mine drainage problems is illustrated by the following language from the 1937 version of the Pennsylvania Clean Streams Law:

> "The provisions of this article
> shall not apply to acid mine
> drainage from coal mines until
> such time as, in the opinion
> of the Sanitary Water Board,
> practical means for the

> removal of the polluting
> properties of such drainage
> shall become known."[174]

Either the gravity of the problem or the state of the art must have developed during World War II, for in 1945 the law was amended to prohibit acid discharges into clean waters devoted to public use; it also enjoined discharges into clean waters not devoted to public use, where the state made available diversion conduits.[175] Since the prohibition did not extend to polluted waters or, for most practical purposes, to waters not devoted to public use, the change was of limited importance. More significant was a new requirement that the Sanitary Water Board approve all drainage plans before a mine could be opened, re-opened, or continued. A mine operator could be required to pre-plan acid drainage control and take abatement measures into account while he mined. The Board could refuse its approval when acid drainage could not be controlled in a particular mine, at least where the receiving stream was clean and devoted to public use.[176]

In 1965 the Pennsylvania General Assembly wrote into the Clean Streams Law findings that:

> "(1) The Clean Streams Law as presently written has failed to prevent an increase in the miles of polluted water in Pennsylvania.
>
> "(2) The present Clean Streams Law contains special provisions for mine drainage that discriminate against the public interest."[177]

This confession was deleted in 1970, but its message was reflected in major statutory changes in 1965 and 1970 which essentially equate acid drainge to other industrial wastes. No mine may now be operated unless a permit is first obtained from the Department of Environmental Resources or unless the operation is permitted by departmental regulation.[178] The same prohibition applies to discharges from presently inactive mines which were operated after 1965 under circumstances requiring a permit. (The Department of Environmental Resources was created in 1971 and has assumed the functions previously exercised by the Department of Mines and Mineral Industries and the Sanitary Water Board.[179]) A violator not only faces civil and criminal penalties such as revocation of his permit, injunctions, civil penalties, fines and imprisonment, but also may be refused a subsequent permit if his violation "demonstrates a lack of ability or intention...to comply with the law or with the conditions of the permit sought."[180]

The specific authority to refuse a permit because of existing violations was prompted by a 1969 lower court decision.[181] The statute at that time did not specifically mention existing violations as grounds for refusal and the court held that such grounds could not be implied.

The specificity with which the Pennsylvania statute has met water quality problems peculiar to mining is not equalled in the other states which are subjects of this study. For example, bonding requirements have long been a mainstay of strip mining regulation, but their use in control of underground mining or water quality is atypical. But in 1970, the Pennsylvania legislature authorized the Department to require a mine operator to post a bond to ensure compliance with applicable regulations and permit conditions, including those "insuring that there will be no polluting discharge after mining operations have ceased." The amount of the bond is within the discretion of the Department, and liability under it continues "until such time as the department determines that there is no further significant risk of a pollutional discharge."[182] Bonding requirements are particularly appropriate in this case since, as with strip mining, the environmental hazards survive the actual operation. The inflexible and low bond amounts set by many strip mine statutes, which so long rendered their bonding requirements ineffectual, have been replaced here by authority in the Department to match the amount to the risk incurred. In view of the widely varying circumstances which may produce mine-caused water degradation and the different protective responses which may result, this flexibility is essential.

The previously discussed provisions dealing with industrial wastes give the Pennsylvania Department of Environmental Resources significant authority to control the water-impairing side effects of mining both during and after the mining operation. These provisions focus on the operator. The Pennsylvania statute also attempts to clarify the responsibility of persons other than the operator. Section 691.316 provides:

> "Whenever the Sanitary Water Board finds that pollution or a danger of pollution is resulting from a condition which exists on land in the Commonwealth the board may order the landowner or occupier to correct the condition in a manner satisfactory to the board or it may order such owner or occupier to allow a mine operator or other person or agency of the Commonwealth access to the land to take such action. For the purpose of this section, 'landowner' includes any person holding title to or having a proprietary interest in either surface or sub-surface rights.
>
> "For the purposes of collecting or recovering the expense involved in correcting the condition, the board may assess the amount due in the same manner as civil penalties are assessed...: Provided, however, that if the board finds that the condition causing pollution

> or a danger of pollution resulted from mining operations conducted prior to January 1, 1966, or, if subsequent to January 1, 1966, under circumstances which did not require a permit..., then the amount assessed shall be limited to the increase in the value of the property as a result of the correction of the condition.
>
> "If the Board finds that the pollution or danger of pollution results from an act of God in the form of sediment from land for which a complete conservation plan has been developed by the local soil and water conservation district and the Soil Conservation Service, U.S.D.A. and the plan has been fully implemented and maintained, the landowner shall be excluded from the penalties of this act."[183]

Civil penalties, to which assessments under this provision are equated, are collectible by the Commonwealth as personal debts; amounts unpaid after demand constitute, upon recording, a lien on the real and personal property of the debtor.[184]

This section is clearly intended to impose liability on persons such as surface owners of abandoned strip mines and refuse piles, and owners of minerals in inactive mines. Its application to owners of severed surface interests where pollutants such as acid drainage are being discharged from inactive underground mines is less clear, since arguably the pollution does not result from a condition on his land. In any case, the statute is useful in that it gives to the state permission for surface access to the mine site.

The wording of the statute is unfortunate in another respect. For present conditions resulting from mining operations before passage of the statute, it limits the liability of the landowner or occupier insofar as assessment of costs is concerned. But the criminal penalties of the statute apply to violations of "any... order of the board...."[185] This conceivably includes orders to correct harmful conditions issued under Section 691.316. Aside from the questionable constitutionality of imposing such a liability when there was no responsibility at the time the mining was performed,[186] the unfairness of imposing such a burden is evident -- and is recognized by the limitation of liability for assessments specified in the second paragraph of Section 691.316.

Despite these technical difficulties, the Pennsylvania statutory scheme provides a good basis for dealing with the problems of divided ownership and abandoned mines. The statutes of Maryland, Ohio and West Virginia do not deal with this matter. They clearly do apply to mine operators, but they speak to persons who "discharge," or "place," or "cause to be placed" pollutants and wastes into state waters,[187] or "allow" such wastes to flow,[188] thereby leaving open questions of responsibility in the severed ownership context. The question whether these terms apply to lessors of minerals or owners of severed surface interests presents the recurrent dilemma. On the one hand some of the statutory language appears broad enough to bring these persons within the circumference of responsibility no matter how passive their role or indirect their connection with the mining operation. A West Virginia statute, for example, requires state approval of "any outlet...for the discharge of wastes, or the effluent therefrom...."[189] On the other hand, the magnitude of the cost of alleviating these conditions, the lack of clarification of the responsibility of these persons at the time they purchased their property interests or granted mineral rights, and the unlikelihood they took such responsibility into account at that time suggest that these statutes should not be interpreted to apply to them -- at least for transactions which took place before the act was passed. The Maryland Attorney General responded to the problem with the following statement:

> "In the case of an active mine the enforcement action would normally be brought against the person conducting the mining operation. However, it is quite possible that the landowner of an abandoned mine site could be considered to be in violation of the provisions of the law if the mine site was causing acid pollution by reason of the failure of the landowner to prevent it. Likewise, a landowner who permits a lessee... or other person to conduct an activity on the land which causes pollution could be found to be in violation of the statute. While enforcement may seem harsh in some instances where the landowner has failed to protect himself the purpose of the water pollution law is to prevent the pollution of Maryland waters with the ultimate objective of producing clean water throughout the State."[190]

Several other Pennsylvania statutory responses to mine related water quality problems are noteworthy. In 1968 the Pennsylvania legislature acted to alleviate the predicament of the small mine operator whose costs of treatment would be too expensive for him to bear and at the same time to provide treatment facilities which are more efficient. In the Land and Water Conservation and Reclamation Act, the Department of Mines and Mineral Industries was authorized to build treatment plants for mine drainage and to permit operators to use them, charging the operators for their use.[191] An amendment to the Clean Streams Law enabled the Department of Environmental Resources to let coal operators (as well as other waste dischargers) pay a fee in lieu of constructing or operating a treatment facility. These payments are to be used for abatement programs or for the construction or consolidation of treatment facilities.[192]

Likewise in 1968 the legislature enacted the Pennsylvania Coal Refuse Disposal Control Act. This statute deals with the wide range of side effects associated with refuse banks, including water quality. It gives the Department broad powers of control over refuse piles, including the power to halt all operations in the pile when there is an imminent danger to persons or property from the threat of sliding or shifting. The act also authorizes an operator in some circumstances to exercise eminent domain powers to obtain interests in land necessary to the lawful operation of a refuse pile.[193]

B. Surface Mining

Until 1939, most state statutes directed at mining dealt with protecting the safety of miners. The major exception was Pennsylvania legislation pertaining to subsidence. But in 1939 the growing dislocation to man and nature wrought by strip mining impelled the West Virginia Legislature to act. The law passed was simple, perhaps naive, but at least a beginning. It required the operator to obtain a permit from the Department of Mines and to post a bond of at least $150 per acre, conditioned on backfilling the pit "so as to minimize the hazard of floods, pollution of streams and water, accumulation of stagnant water, and the destruction of...soil for agricultural purposes." The sanctions for each day's violation were jail for up to one year or a fine of $50-$500, or both.[194]

The list of states regulating surface mining slowly increased, with each state borrowing improvements added by others. Maryland and Ohio adopted statutes in 1947,[195] and shortly thereafter Maryland's was declared unconstitutional for including within its coverage only one of the two coal producing counties in the state.[196]

TABLE 4

WATER QUALITY REGULATION

State	Prior Approval	Prohibited Acts	Information	Bond	Supervision	Civil Sanction	Criminal Sanction
Md.	Permit needed for discharges which violate Dep't. of Water Resources regulations. Regulations require permit for discharge of any water or waste water into waters of the state.	To cause pollution of state waters or violate effluent standards. Pollution is defined as change in temperature, taste, odor, color, etc.	A plan may be required as deemed necessary by Dep't. of Water Resources before a permit will be issued.	None.	Dep't. of Water Resources has general supervisory power to administer and enforce the subtitle and regulations.	Upon showing by Attorney General that a person is or is about to violate any valid order of the Dep't. an injunction shall be granted without need to show lack of remedy at law. Dep't. may issue corrective order.	Violation of subtitle or failure to perform duty imposed by subtitle or order is a misdemeanor. Fine: up to $10,000 or 1 year imprisonment or both.
Ohio	Permit needed to place substances into water which pollute it -- render it harmful to public health, animal or aquatic life or to use as domestic water supply.	To cause pollution without permit.	Board may require plan as it deems relevant.	None.	Water Pollution Control Board may investigate on its own to insure compliance. Citizens may request inquiry.	Attorney General upon request of Board will bring action to enjoin violator or one threatening to violate statute or Board order.	Violation of statute or of Board order shall be fined up to $500 or imprisonment up to one year or both.
Pa.	Industrial waste must meet regulations or be covered by permit. Operation of a mine must meet regs. or be covered by permit.	To discharge or permit to flow into waters of state any industrial waste except as provided by statute. Board may withhold permit of past violator.	Any person who is discharging or permitting to flow into waters of state any industrial waste is required to supply basic information re same to Dep't. of Envir. Resources.	Dep't. may require a bond from mine operators to insure compliance with statute, regulations or conditions of the permit. Liability on bond continues until it is determined that there is no risk of pollution.	Dep't. of Environmental Resources shall investigate as far as all facts in relation to the pollution of state waters.	Board may order landowner to correct condition on his land causing or about to cause pollution, or may order landowner to allow miner or state on land to correct it. Cost may be assessed as a civil penalty. Civil penalty assessable with lien: $10,000 plus $500/day.	Violation of statute, regs. or order is summary offense. Fine: $100-$1000, default in payment results in 60 days in jail. Second violation within 2 years, Fine: $100-$5000 or 1 year in jail or both.
W.Va.	Permit needed to allow flow of industrial waste into waters of the state. Permit needed to open, operate, or abandon a mine.	To allow flow of industrial waste or open, operate or abandon a mine without a permit.	Information required as chief requests it.	None.	Chief of Div. of Water Resources may investigate activities to insure compliance.	Chief may seek injunction of violation or noncompliance with statute, regs., or permit conditions. Chief may order corrective steps. Violators who cause fish loss shall be liable for restocking.	Persons who pollute, violate statute, regs. or order or who don't have permits are guilty of misdemeanor. Fine: $100-$100 or 6 months or both. Willful violators. Fine: $100-$10,000 or 6 months or both.

Source:

Md. Code Ann. art. 96A, sec.21 et seq. (Supp. 1971) and regulations thereunder;
Ohio Rev. Code Ann. sec.6111.01 et seq. (Page 1953 and Supp. 1970);
Pa. Stat. Ann. tit. 35, sec.691.101 et seq. (1964 and Supp. 1971) and regulations thereunder;
W.Va. Code Ann. sec.20-5A-1 et seq. (1970) and regulations thereunder.

This was the only statute in the four states in this study to be invalidated, and the defect was remedied in new legislation passed in 1955.[197]

Pennsylvania's first bituminous surface mining legislation in 1945 was typical of early attempts at regulation.[198] It required, within one year of completion of the operation, backfilling of sufficient spoil to cover the exposed coal face, grading of this cover, leveling and rounding of spoil-bank peaks and planting the mined area (or a substitute area if permitted) with trees, shrubs or grasses as prescribed by the Secretary of Forests and Waters. The major guarantee for these requirements was a bond of $200 per acre (minimum, $2,000), which was forfeited if reclamation was not properly performed. The primary regulatory tool was a certificate which had to be filed by any miner before opening an open pit mine, and which had to be renewed at the end of each year. The failure to register was punishable by a fine not exceeding $5,000. In recognition of the need for government reclamation activities if the operator failed to reclaim by himself, a Bituminous Open Pit Mining Reclamation Fund was established consisting of forfeited bonds and registration fees.

This statute was gradually strengthened over the next two decades. By 1961 the required bond had increased to $400 per acre ($4,000 minimum). The bond was divided, so that most was released upon approval of the backfilling, leaving $60 per acre to be withheld until approval of the replanting. Although still low in comparison with the cost of the reclamation in many instances, the amount of the guarantee was becoming more realistic. Another amendment prohibited reject coal or combustible material from being included in the overburden backfilled over the coal face. Particularly important were the stronger sanctions. The Attorney General was authorized to seek injunctive relief, the Secretary of Mines was authorized to order a halt to mining at a site where violations occurred, and, most important, issuance of a certificate was conditioned upon a finding that the miner had complied with reclamation requirements in the past.[199]

The year 1963 brought a wholesale revamping of the bituminous strip mining statute, and this forms the basis of the present law.[200] Augering is now included and an exemption for small operators (less than 250 tons per year) was eliminated. Reclamation plans must now be approved in advance and the uniform requirements of the early law have given way to more flexible administrative requirements which may be tailored to the needs of different mine settings. Backfilling must be kept current while mining is in progress. A land reclamation board, made up of representatives of different interests in government, the conservation field and the mining industry, was created to exercise supervisory powers over the reclamation plan; this board was eliminated when the Department of Environmental Resources was created in 1971, however, and its responsibilities assumed by the Department.[201] Like the substantive requirements, the bond also has been made more flexible: It is now $500-$1,000 per acre, with a $5,000 minimum. (In West Virginia, the Legislature has increased the bond to $600-$1,000 per acre, with a $10,000 minimum).[202] The device of a single certificate per mining operation was replaced by a dual registration requirement: an annual license for each miner, with a $300 fee going to the reclamation fund, and a permit for each mining site. Neither the license nor the permit may be issued to violators of the statute, again probably the most significant sanction. Reclamation must now commence within six months of completion or abandonment of the operation. Finally, the Legislature recognized the possibilities of a law becoming weakened through nonenforcement. Citizens were given the right to sue enforcement officials in a mandamus action to obtain enforcement of the Act, when it was "wilfully or deliberately" not being enforced. A similar provision was adopted in West Virginia.[203]

West Virginia has also adopted what is perhaps the broadest control short of an outright interdiction of surface mining. The Director of Natural Resources was empowered to prohibit such mining in any area where it may create stream pollution, landslides, destruction of recreational values and other hazards to life and property. Even in areas where stripping is generally permitted, a permit may be refused or revoked if proper reclamation is unlikely to be performed or if substantial sedimentation, landslides or acid pollution cannot be prevented.[204]

An outline of the present laws of Pennsylvania, Maryland, Ohio and West Virginia is presented in Table 5.

TABLE 5

SURFACE MINING REGULATION

Maryland

PRIOR APPROVAL:	License required to be a strip miner. Permit required for each job. Reclamation pre-plan required for permit. If ownership is split, land owner's consent is needed to allow miner or state to enter land to reclaim it. A sediment control plan must be approved by local soil conservation district.
PROHIBITIONS:	License may be denied if operator fails to comply with statute. Job permits not issued to past violators.
BONDS:	$400/acre, $3000 minimum bond or equivalent. Separate revegetation bond: $50-$125/acre. Bond released when final report (incl. planting report) is approved.
FEES:	License fee: $100 plus $10 a year to renew. Special fee for reclamation: $30/acre matched by state.
RECLAMATION FUND:	Special fee, license fee and forfeited bonds go to reclamation fund to be used to reclaim land for which bond was forfeited then on other affected land. Fines for mining without license or permit go to special reclamation fund.
CIVIL SANCTIONS:	Violation of statute or of regulations results in notice to cease. Continued noncompliance may result in cancellation of permit. Violation of statute for which liability has been charged on bond results in forfeiture.
CRIMINAL SANCTIONS:	Mining without a license: $5000 to $10,000 or 6 months or both. Permit violation: $500-$5000. Sediment control violation: up to $5000 or 1 year imprisonment for each violation.
REPLANTING:	State forester makes recommendations for each job.
RECLAMATION:	Completed within 90 days; reject and toxic material buried; detailed plan in regulations.

Source:
Md. Ann. Code art. 66C, sec.657 et seq. (1970 and Supp. 1971) and regulations thereunder; art. 96A sec.105 et seq. (1964 and Supp. 1971).

TABLE 5 (continued)

Ohio

PRIOR APPROVAL:	License required for each job good for only one year. If ownership is split, land owner's consent is needed to allow miner or state to enter land to reclaim it.
PROHIBITIONS:	License not issued to past violators. No license where sediment will damage land of others.
BONDS:	$300/acre, $2000 minimum bond or equivalent. Part of bond released after backfilling and regrading is approved, $225/acre. Remainder of bond released when replanting approved.
FEES.	License fee: $75 plus $15/acre per year.
RECLAMATION FUND:	All money paid to Chief of Division of Forestry and Reclamation go to a reclamation fund. Expended for reclamation only upon appropriation by General Assembly.
CIVIL SANCTIONS:	Violation of statute results in notice to cease. Continued noncompliance may result in cancellation of license. Injunctions by Attorney General possible to enforce statute.
CRIMINAL SANCTIONS:	Failure to amend license or deposit bond: $300-$1000. Mining without license or failing to take steps to minimize discharge of pollutants: $300-$1000.
REPLANTING:	Replanting according to approved plan or an alternative plan without approval if operator will be willing to extend bond liability from one to five years.
RECLAMATION:	Reclamation must start within 2 years and 2 months of end of first year of mining. Spoil banks must be reduced. Acid water must be prevented, if possible.

Source:
Ohio Rev. Code Ann. sec. 1513.01 et seq. (1963 and Supp. 1970).

TABLE 5 (continued)

Pennsylvania

PRIOR APPROVAL:	License required to be a strip miner. Permit required for each job good for entire job. Reclamation pre-plan required for permit. If ownership is split, land owner's consent is needed to allow miner or state to enter land to reclaim it.
PROHIBITIONS:	License may be denied if operator fails to comply with statute. Job permits not issued to past violators.
BONDS:	$500-$1000/acre, $5000 minimum bond or equivalent. All but $100/acre released after backfilling is approved. Remainder of bond released when replanting approved.
FEES:	License fee: $300 plus $300 a year to renew.
RECLAMATION FUND:	Special fee, license fee and forfeited bonds go to reclamation fund to be used to reclaim land for which bond was forfeited, then on other affected land. Fines for mining without license or permit go to special reclamation fund.
CIVIL SANCTIONS:	Violation of statute or of regulations results in notice to cease, continued noncompliance may result in cancellation of license. Violation of statute for which liability has been charged on bond results in forfeiture. Injunctions by Attorney General possible to enforce statute.
CRIMINAL SANCTIONS:	Mining without a license: $5000 to $10,000 or 6 months or both. Permit violation $500-$5000 or 3 months or both.
REPLANTING:	Replanting within one year of backfill according to detailed regulations.
RECLAMATION:	Backfilled in accord with pre-plan within 6 months of completion or abandonment. Replant within one year; detailed plan in regulations.

Source:
Pa. Stat. Ann., tit. 52, sec. 1396.1 *et seq.* (1966 and Supp. 1971) (bituminous coal) and regulations thereunder.

TABLE 5 (continued)
West Virginia

PRIOR APPROVAL:	Permit required for each job good for only one year. Reclamation pre-plan required.
PROHIBITIONS:	Job permits not issued to past violators. No permit where sediment and acid drainage cannot be prevented feasibly. No permit to a revoked permit holder unless bond was actually paid. Two year prohibitions on strip mining in counties where none was lawfully done in 1970.
BONDS	\$600-\$1000/acre, \$10,000 minimum bond or equivalent. Remainder of bond released when replanting approved.
FEES:	Permit fee: \$100 plus \$50 a year to renew. Special fee for reclamation: \$60/acre.
RECLAMATION FUND:	Special reclamation fee credited to special reclamation fund which is used according to Dep't. of Nat. Res. plan to reclaim affected lands.
CIVIL SANCTIONS:	Violation of statute or regs. results in cease order or permit suspension. Permit revocation and bond forfeiture possible.
CRIMINAL SANCTIONS:	Mining without permit or bond with false information: \$100-\$1000 or 6 months or both. Deliberate violations of above: \$1000-\$10,000 or 6 months or both. In addition to fines, violator has to pay cost of reclamation.
REPLANTING:	Appropriate vegetation planted in first proper season. Type depends on soil. Done according to detailed regs.
RECLAMATION:	Reclamation within one year of expiration of permit, but regrading must be kept current. Detailed plan in regulations and 1971 statutory amendments.

Source:
W.Va. Code Ann. sec. 20-6-1 et seq. (1970 as amended 1971).

C. Sealing Requirements

All four subject states have adopted statutes requiring sealing of underground mines. These statutes, however, were enacted either quite recently or had as their purpose the protection of the safety of persons who might come near the mine. Thus, it is not surprising that few inactive underground mines have been sealed with acid drainage abatement in mind.

For example, Maryland requires entrances of abandoned mines to be fenced and, if sealing is done, that the work be done in a substantial manner, with incombustible material and a pipe and cap or valve.[205] More directly related is the requirement that strip mine operators, as part of the reclamation process, seal underground mine openings at the base of the final cut so as to avoid dangers resulting from the impoundment of large quantities of water.[206] West Virginia now also requires sealing or ventilation of abandoned mines (after July 1, 1968) with incombustible materials as prescribed by the Director of Mines.[207] Ohio requires abandoned mine openings (after August 26, 1949) to be sealed, but goes into somewhat greater detail about the nature of the seal, specifying construction of concrete or masonry bulkheads effectively anchored.[208] Such seals protect against discharge of some types of mine drainage, but the problem is too complex to be fully solved by a provision such as this.

Although Pennsylvania had adopted similar sealing statutes in the past, a recent amendment re-defines mine sealing to include the closing of an opening into a mine in such a manner as to minimize or stop the pollution of the waters of the Commonwealth.[209] Operators must seal all openings through which water may flow into any of the streams of the Commonwealth, beginning with 60 days of the abandonment of the mine and finishing within six months of abandonment. The basic statute for which this is an amendment was adopted in 1947 and provides that the state shall seal at its own cost abandoned mines not in possession of the operator on the date of the act. Seals approved by the Department must be maintained by the Commonwealth, and the Department of Environmental Resources is authorized to enter on lands were openings are located in order to seal. Any sealing done by private individuals must be in accordance with a plan approved by the Department.

It should be noted that these statutes which require sealing typically apply to mines in active operation at the time of the act, and not those abandoned before. The Pennsylvania act does refer to those abandoned before, but chiefly to enable government sealing work to be done.

Still, what constitutes an abandoned mine can play a role, since it may be difficult to know whether a mine is abandoned after the date specified or whether the operator has only temporarily left it. Some Pennsylvania statutes specify a time period after which the mine is presumed to be abandoned.[210] A presumption of this kind is quite useful in protecting against environmental hazards such as acid discharges. If the miner intends to return to the mine, he should be impelled to do so quickly or to seal the mine (or carry on other abatement or reclamation activities) pending his return. A specified time period would accomplish this. A similar principle applies in strip mining, where the operator should be required to reclaim not just after abandonment of the entire operation, but also if the operation is temporarily vacated with an intention to return. Requirements to backfill concurrently with the operation help provide this protection.[211]

A specified time period is preferable to the uncertainties of the traditional common law rule, which defines abandonment in terms of an intention of the operator to give up his rights combined with external acts reflecting that intention.[212] This test was developed to ascertain whether property rights, particularly leasehold rights, were surrendered. In these cases, the balance struck is primarily between private parties. The test recognizes the need for protection of the holder of the rights allegedly surrendered. But the public interest in environmental quality suggests that activity designed to enhance that quality be begun as quickly as possible, even if the operator intends to return to the mine -- an intention clearly inconsistent with the traditional defininition of abandonment in other contexts.

Whatever the purpose of mine sealing, any requirement is inadequate if maintenance and protection of the seal are not assured. Failure to provide such protection is one of the reasons for the long-run ineffectiveness of the Federal Works Progress Administration sealing program during the Depression. Pennsylvania's statute is the only one which provides for maintenance, the responsibility being on the Commonwealth.[213] Pennsylvania law also prohibits the reopening of sealed mines without the approval of the Department of Environmental Resources.[214] West Virginia takes a somewhat different tack, requiring ten days' notice to the Department of Natural Resources before opening any old or abandoned mine in which water has collected to such a degree that it may drain into a water course.[215] Although Departmental approval apparently is not required, West Virginia's water quality statute does require a permit before any mine may be re-opened, if pollution is likely to result.[216]

D. Subsidence

Although a detailed consideration of this problem is beyond the scope of this study, brief mention should be made. Pennsylvania is the only one of the four states in this study which has dealt with subsidence in significant degree by statute.

It has had legislation in this area for more than 50 years. Its present scheme is three-pronged, regulating support rights, creating insurance and authorizing governmental intervention. The major regulatory statute is the Bituminous Mine Subsidence and Land Conservation Act of 1966.[217] Although similar in some respects to a statute declared unconstitutional in 1922,[218] this act is substantially more complex. In addition to prohibiting mining which results in subsidence of public buildings, residential buildings and cemetaries, the act requires the miner to obtain a permit from the Department of Environmental Resources. The permit is to be issued only if the application shows sufficient support will be provided for protected surface structures, and may be revoked if subsidence damages occur and compensation or repairs not made. Mine maps or plans must be made, kept current, and recorded as public records. Notice of mining must be given to political subdivisions and surface owners. Surface owners who have or build structures without support rights may require the owners of the economic interest in the coal to sell their support rights (with the amount of compensation ultimately decided under the Commonwealth's Eminent Domain Code if a satisfactory amount is not agreed upon). Surface owners without support rights who are entitled to take advantage of this procedure lose all other legal recourse for subsidence damages if they do not do so.[219]

The Anthracite and Bituminous Coal Mine Subsidence Fund, made up of premiums paid by subscribing home owners, was created in 1961 and supported by an initial appropriation of one million dollars.[220] The insurance principle is particularly appropriate for the subsidence problem, since this risk may or may not materialize and, if it does, may occur at a time far in the future which cannot be predicted. Also, risks which may not have been serious when the surface was rural or forested, become much more serious when residences or other buildings are constructed. Thus, protection against the risk can be added through insurance when the size of the risk increases by virtue of new surface construction.

The cost of alleviating subsidence where sufficient support was not left in the past suggests governmental action, and such is the third avenue of attack in Pennsylvania. Under the comprehensive Land and Water Conservation and Reclamation Act of 1968,25 million dollars was allocated for remedial action against subsidence over abandoned mine operations.[221] The Commonwealth's activities in this regard were aided in 1968 by adoption of a statute designed to overcome the delays created by inability to locate property owners and obtain the right to enter on private property to combat subsidence. If an emergency exists such that immediate action must be taken, and if the owner of the property on which entry must be made are unknown, "not readily available" or unwilling to permit the governmental agency involved to enter, the governmental agency involved may enter and take the necessary remedial action upon giving notice to known owners or, if unknown, by posting and advertisement. The expenses of the remedial action and any benefits accruing to the land are charged against the land to offset any claims by the owner for damages.[222] By its terms, this statute applies to fires in mines and refuse banks as well as subsidence.

E. Public Works Projects

It is clear that governmental funds must sponsor some of the rehabilitation which is necessary in the area of environmental control of mining side effects. This is true particularly of abandoned mines, where the immense cost cannot be borne by private individuals.

One source of financing has been the reclamation funds established either by fees and bond forfeitures or by special per-acre payments under strip mining statutes. These funds have been too small, however, to handle the demands imposed by the requirements of abandoned mine reclamation.

Federal funds have been made available for demonstration projects under the Federal Water Pollution Control Act, for both demonstration projects and general reclamation activities under the Appalachian Regional Development Act, for mine sealing and filling in the Pennsylvania anthracite fields and for combatting mine fires.[223] On the state level, the most comprehensive scheme is that in Pennsylvania, where a 500 million dollar bond issue was authorized under the Land and Water Conservation and Reclamation Act of 1968.[224] Almost 90% of this amount is allocated to correction of adverse environmental side effects from past mining. In Maryland a five million dollar bond issue was authorized in 1970 to clean up drainage from abandoned mines.[225]

F. Miscellaneous

The statutes previously described constitute the major state legislation in the areas under study here. Occasionally, others, such as public nuisance statutes, may be brought into play. This section describes some of them.

1. Soil Conservation Districts

Local soil conservation districts have played a large role in some of the areas under concern here, particularly in strip mine reclamation. Most work in the past has been of an educational and advisory nature.[226] In addition, the expertise of local soil conservation experts has been brought into play by such means as presence on the Land Reclamation Committee in Maryland and through the recently enacted Maryland Sediment Control Law, which gives local conservation officials significant powers to regulate any activity, including strip mining, which may result in erosion and sediment.[227]

2. Local Controls

Some types of mining, particularly surface mining, have become subject to local controls such as zoning ordinances. Thus, it is not uncommon to find ordinances specifying control and use of land insofar as sand and gravel operations are concerned. These operations lend themselves to local control, since the nature of the market demands that they be located close to a place where the product will be used. Coal mining has been less subject to this kind of control, but occasional ordinances have dealt with it.[228]

The same considerations which apply to determining the constitutionality of state regulation of surface mining applied to local regulation. Two additional factors come into play in the local arena, however. First, the control involved must be authorized by the local government's enabling legislation. This is often implied from a more general authorization concerning land use and control. More difficult is the question whether the state, by enactment of a strip-mine control statute, has pre-empted the field from the local government. The preemption principle was applied in invalidating a local regulation in Ohio.[229]

An alternative technique was used in West Virginia, where the legislature itself in 1971 prohibited strip mining for two years in those counties where strip mining had not been done in 1970.[230]

3. Interstate Compacts

Although not strictly state statutory responses, interstate compacts should be noted here. All four states in this study belong to major compacts which give significant regulatory powers to the compact commissions. The major compacts of importance here, the dates of their creation and the states which are parties are:

(1) Ohio River Valley Water Sanitation Compact (ORSANCO) (1948) (Ohio, Pennsylvania, West Virginia, Illinois, Indiana, Kentucky, New York, Virginia);[231]

(2) Susquehanna River Basin Compact (1970) (Maryland, Pennsylvania).[232]

Although the Susquehanna Compact gives substantial regulatory powers to its commission, both over basin waters and riparian lands, it is untested. On the other hand, ORSANCO has a long history of dealing with the water quality effects of coal mining. Its history in the area of acid mine drainage parallels that at the state level -- from early inaction to growing regulation. ORSANCO has played a significant educational and advisory role as well.[233]

The Interstate Commission on the Potomac River Basin[234] was established in 1941 by Maryland, Pennsylvania, West Virginia, Virginia and the District of Columbia. The Commission has primarily served an educational, research and advisory role. A Potomac River Basin Compact similar to the Susquehanna compact has been prepared but has not yet been ratified by enough states to go into effect.

The Interstate Mining Compact has been ratified in Pennsylvania and Kentucky. Aimed specifically at cooperation in surface mining control, it is of an educational and advisory nature and has not yet been ratified by the requisite number of states to become effective.[235]

VI

CONSTITUTIONAL LIMITATIONS ON STATE ACTION

The harmful environmental side effects from coal mine operations have already been detailed. States have at their disposal a variety of strategic responses. In terms neither all inclusive nor mutually exclusive these responses may be categorized as follows:

(a) prohibition of side effect;
(b) requirement of operator investment to remedy the side effect; or,
(c) government investment to remedy the side effect.

This chapter will investigate the extent to which state or federal constitutional provisions limit the ability of the states to make use of these strategies.

It is more or less an accepted notion of constitutional government that the powers of state legislatures are plenary except as limited by provisions of the state or federal constitution. This residuum of regulatory muscle is referred to as the "police power" and was traditionally said to include regulations designed to promote the public "health, safety and morals."[236] At one time this definitional trinity may have itself limited the permissible bounds of state activity. Not today (except for some lingering doubts as to the propriety of actions for purely aesthetic purposes)[237] state legislatures have authority to regulate "men and things."[238] The United States Supreme Court aptly described the present state of the police power as follows:

> "Subject to specific constitutional limitations when the legislature has spoken, the public interest has been declared in terms well-nigh conclusive. In such cases the legislature, not the judiciary, is the main guardian of the public needs to be

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> served by social legislation, whether it be Congress...or the states...."[239]

What then are the "specific constitutional limitations" on legislative action?

A. Prohibitions of Side Effects

There are an all but unlimited number of ways in which the police power might be used to prohibit externalities from coal operations. Two typical illustrations are presented. First, mining operations make extensive use of water as a waste transport medium -- both seepage and particulate matter may be disposed of into receiving streams. The states have prohibited or limited such effluent discharges through the adoption of water quality standards.[240] Second, Congress has under consideration a bill which would prohibit all future surface mining.[241] Maryland and West Virginia also have regulations prohibiting traditional surface mining on slopes greater than 33 degrees in grade, because of landslide and revegetation problems.[242]

Prohibitions of these sorts may be called into constitutional question under provisions of the federal and state constitution. It is simple to frame the constitutional principles in abstract terms. Under the Fourteenth Amendment to the United States Constitution and more or less analogous provision in state constitutions, the states may "regulate" the use of private property under the police power, but the states may not "take" private property without payment of just compensation. The economic impact of this theorem is likewise simple to state: if the state is permitted to pursue its purpose under the police power, any resulting reduction in property value is borne by the private owner; if the state is required to use its power of eminent domain, this cost is swallowed by the state.

While the consequences which follow from the determination that a governmental action is either a "taking" or "regulation" are clear, the distinction is less than clear. There is a necessary tenuity in any distinction between governmental activities which have the same economic consequences -- reduction of the value of property. In context and historical sweep, however, the common law provides more explicit predictors. To illustrate these, consideration will be given to the constitutionality of prohibitions of discharges of mine wastes into receiving streams, and of prohibition of all surface mining activities.

1. Prohibition of Discharge of Mine Waters into Receiving Waters

The Federal Water Pollution Control Act requires the states to adopt quality standards for all navigable waters.[243] These standards which also have been supplemented by quality standards for non-navigable waters in the four states have a consequential effect of limiting the nature of effluents that mining operators can deposit in receiving waters. Moreover, a recent Presidential Order[244] directed the Corps of Army Engineers to vitalize the River and Harbors Act of 1899[245] and to require a permit as a prerequisite to discharge of any industrial effluent.

Enforcement of stringent quality standards or denial of a Corps permit would significantly reduce or destroy the value of mining property. But it would seem that such governmental actions are relatively safe from constitutional attack. As previously seen the right to use state waters as a waste disposal system has historically been limited by rights of other landowners to make reasonable use of the same waters, and if one landowner discharges an excessive load he may be enjoined or found liable in damages. Hence, at least in formal terms, enforcement of water quality standards or denial of permits may be said to merely substitute new restraints for old ones.

However, as the recent case of Reserve Mining Co. v. Minnesota Pollution Control Agency[246] illustrates, state enforcement actions are not totally immune from constitutional difficulties. In that case the Reserve Mining Company had between 1947 and 1969 invested 350 million dollars in a taconite mining facility. In connection with this operation and pursuant to federal and state permits it discharged tailings into Lake Superior. In 1969 the state water pollution control agency revised its water quality standards so as to include an "anti-degradation" clause and effluent standards, both of which the Reserve discharges would arguably be in violation of.

The Minnesota district court held that these revised standards were not themselves unconstitutional but that their enforcement against Reserve Mining "without granting that company a reasonable opportunity to adjust and modify its mode of operation would amount to a constitutional violation and a 'taking of property without due process of law.'"[247] The court retained jurisdiction in an effort to encourage establishment of a modified method of discharge through negotiations between the parties. Hence, stringent limitations on discharges from mining operations which interfere with effective utilization of a facility in which there has been a significant capital investment may be constitutionally vulnerable.

2. Prohibition of Strip Mining

Governmental action may frontally attack the environmental problems of coal operations by prohibiting mining operations themselves. An example of this tactic is found in H.R. 4556, a bill now pending in Congress, which provides as follows:

> "...no person shall open in any state any new, inactive, or abandoned surface coal mine for the purpose of conducting surface coal mining operations thereon."[248]

The question obviously arises as to whether the government may so prohibit strip mining, without paying compensation.

It is difficult to effectively answer this question in terms of the "crazy-quilt pattern of Supreme Court doctrine,"[249] but several leads may be followed. The first Justice Harlan attempted to define the "taking" of property in a relatively literal fashion. In the leading case of Mugler v. Kansas[250] he asked the question whether the governmental action physically invaded a private estate, or dispossessed a private owner, and answered that since all that was involved was a prohibition against the sale of liquor there was no "taking." Likewise, it might be said that a prohibition against strip mining neither invades nor dispossesses and is therefore not "taking."

Justice Holmes developed a more pragmatic economic test which can lead to differing results. Holmes focused on the economic impact of government action and posited that if it resulted in an excessive reduction in the value of private property it constituted a taking. Applying this test in Pennsylvania Coal Co. v Mahon[251] he found that Pennsylvania legislation prohibiting deep mining under houses and streets and within city limits, to be excessive.

While the Holmes approach certainly has the virtue of flexibility, it is not particularly helpful in predicting results -- what amount of reduction in property value is too much? Some state court decisions have addressed themselves to this question with surprising exactitude. For example, an Illinois court expressed the following view about a zoning ordinance which barred strip mining:

> "The destruction or value in the land involved is very great. For coal purposes it is twenty times as valuable as when restricted to agriculture. We can find no parallel to such an attempted invasion of property rights. We can find no case in Illinois sustaining a zoning regulation prohibiting a specific use where that use was more than three times the permitted use."[252]

Most judicial pronouncements, however, are more abstract. For example, the Maryland Court of Appeals in a zoning case presented the following test of "taking:"

> "If a property owner be unable, permanently to use his property for any of the permitted purposes and is therefore deprived of all beneficial use thereof... he may successfully attack the validity of the ordinance as a taking of his property without compensation."[253]

What this language means is obviously (and perhaps purposefully) murky. But one way of quantifying it is to create an analogy to public utility rate-making cases and to constitutionally guarantee property owners a "fair (5-6%) return" on their investment. Government action which precludes the possibility of such a return thence becomes a "taking." Support for this approach can be extrapolated from City of Baltimore v. Cohn. There a property owner successfully challenged the constitutionality of a zoning ordinance limiting his tract to residential development with a factual demonstration that:

> "...no bank, insurance company, loan company, or government agency would be willing to finance a residential development of the tract."[254]

The court, it appears, respected the institutional lender as a rational profit maximizer and was duly impressed with testimony that orthodox financing was not available.

Based upon the above, some very tentative generalizations can be made as to the constitutionality of the application of a prohibition against surface mining. The holder of the property interest (be it a fee simple estate which includes mineral rights or separate mineral rights) is at least entitled to a fair return on his investment, and if application of a ban on strip mining precludes such a return, compensation is constitutionally mandated. A corollary of this proposition would seem to be that if there has been severance of the mineral interest, then a prohibition against strip mining will result in a taking unless there is a feasible alternative means of extracting the coal. Several reasons can be advanced in support of this conclusion. The fact of severance assures an investment in the mineral rights as such, dispells the possibility of productive non-mining uses, and in terms of Harlan's test makes the prohibition tantamount to a physical dispossession. But both the proposition and the corollary are subject to qualifying stresses. Some courts have denied compensation notwithstanding governmental action which ostensibly prevents private parties from receiving a fair return, upon proof of sufficiently important public need.[255] One conceit that sometimes can be used in reaching this result is the return to the Harlan test.[256] Conversely, some courts have seemed concerned not in merely assuring some beneficial use of property (i.e., a fair return on investment) but in guaranteeing a return to some degree commensurate with the present fair market value of property (including coal development potential).[257] Such a concern, if taken seriously, would mandate compensation as a prerequisite to the banning of strip mining unless and in the unlikely event that there is some alternative, equally profitable use (e.g., deep mining, industrial development, etc.).

B. Requirement of Operator Investment

As previously discussed there are few if any constitutional limitations on the abilities of the states to require coal operators to make investments to prevent discharge of mine wastes into receiving waters. Such requirements are typically upheld as valid exercises of the state's police power. But a nicer constitutional question develops when the states attempt to impose the cost of remedying past mining degradations on the present generation of miners. Such attempts typically take the form of licensing taxes imposed on strip mine operations, the proceeds from which are earmarked for use in the reclamation of previously stripped land.

The basic problem is one of equity -- is it fair to allocate the cost of past environmental abuse on today's coal miners. This question is converted into constitutional terms through the Fourteenth Amendment of the United States Constitution. In 1890 the United States

Supreme Court said:

> "The provision in the Fourteenth Amendment, that no state shall deny to any person within its jurisdiction the equal protection of the laws, was not intended to prevent a state from adjusting its system of taxation in all proper and reasonable ways....It may impose different specific taxes upon different trades and professions....We think that we are safe in saying, that the Fourteenth Amendment was not intended to compel the State to adopt an iron rule of equal taxation."[258]

In 1920, however, the court observed:

> "Any classification is permissible which has a reasonable relation to some permitted end of governmental action.... It is enough...if the classification is reasonably founded in the purposes and policy of taxation."[259]

Hence, the Equal Protection Clause may mandate some nominal nexus between the class to be taxed and the goal to be accomplished with the revenues.

There is a rather clear economic justification for imposing the cost of cleaning up past coal mine scars on the present crop of strip mine operators. To the extent the market will allow, these strippers will pass the cost on to the coal-using public. Hence, indirectly the tax will fall on the group which has benefitted from the scarification of the countryside in terms of cheaper coal. The "user-pays" justification, coupled with the court's announced disinclination to review the classifications,* would seem to assure the legality of such earmarked funds under the federal constitution.

The scope of judicial review of legislatively created tax classification is presumably broader in Pennsylvania, which has a state constitutional provision requiring the "uniform" application of state taxes.[261] This clause was used to attack a reclamation fund financed from a tax levied against open-pit operators on the theory that the tax lacked uniformity in that a similar tax was not levied against strip mine operators. The Pennsylvania Supreme Court noted the substantial differences in strip mines and open-pit mines and upheld the legislation with the following statement:

> "The payment of the registration fee /used for reclamation fund/ must be made by all the operators in this class.

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*In Connelly v. Union Sewer Pipe Co., the Supreme Court said:

> 'A tax may be imposed only upon certain callings or trades, for when the state exerts its power to tax, it is not bound to tax all pursuits or all property that may be legitimately taxed for governmental purposes. It would be an intolerable burden if a State could not tax any property or calling unless, at the same time, it taxes all property or all callings. Its discretion in such matters is very great and should be exercised solely with reference to the general welfare as involved in the necessity of taxation for the support of the state."[260]

> There is, therefore, no basis for the suggestion that the Act does not operate uniformly on all the members of the class."[262]

Hence, in Pennsylvania the courts uphold reclamation funds with a bit of rhetorical sleight-of-hand.

C. Government Investment

The two strategies already discussed -- prohibitions and requirements of operator investment -- are best employed where an environmental degradation can be attributed to an on-going mining operation. Where the side effects -- mine acid formation or surface scars -- have no relationship to continuing operations direct government action may be called for. Since approximately 6.6 billion dollars would be required just to abate existing mine acid drainage in Appalachia, government is the only institution with financial capacity to deal with the problem;[263] since the benefits from abatement programs are diffuse, government funding seems appropriate.

Federal abatement activities date back to mine seal projects started in 1935. Following the World War II hiatus there were no government sponsored reclamation and abatement activities until Pennsylvania enacted the Coal Mine Sealing Act in 1947. This led to construction of approximately 900 seals on unused coal mines.[264] More recently in 1968 Pennsylvania floated bonds and created a fund to be used not only for sealing but also for restoration of strip mined land.[265] In addition, Maryland, acting pursuant to the impetus of possibly 75% federal funding, has enacted enabling legislation to carry out state sponsored reclamation and abatement projects.[266]

The most direct constitutional limitations on governmental action take the form of restrictions on the ability of the states to incur debt. Borrowing for public works projects got started in 1817 with New York state's construction of the Erie Canal. Within five years after its completion (and financial success) Pennsylvania, Maryland and Ohio were likewise borrowing money for canal and railroad construction. When depression times came in 1841 Maryland and Pennsylvania defaulted on their debts along with seven other states.[267]

This bad debt experience led to state constitutional restrictions on the debt-incurring powers of the state legislatures. The provisions adopted in Ohio, Pennsylvania and West Virginia ostensibly prohibited all debt incurrence except for narrowly limited purposes; the provision adopted in Maryland limited the term of state debts to fifteen years (thereby limiting the efficacy of state obligations for long-term borrowing).[268]

As is so often the case what the states were forbidden to do by one method they managed to do by another. Through a process of constitutional trial and error the states have gotten judicial approval for various methods of long-term financing of capital projects. In Ohio and West Virginia this may be accomplished through the use of revenue bonds provided that they are to be paid from an earmarked fund rather than general revenues.[269] In Maryland the fifteen-year debt limitations can likewise be avoided.[270] In Pennsylvania debt restrictions may be avoided through the creation of an independent public corporation which then incurs the requisite debt.[271]

Use of these tactics of constitutional circumvention for novel purposes obviously involves a risk. In the absence of a test case providing judicial approval, the bonds may be unmarketable. Hence, neither Pennsylvania nor Maryland, the two states which have already enabled the floating of bonds for reclamation and abatement purposes, has made use of the evasionary tactics. In Maryland the legislation authorizing flotation of five million dollars worth of bonds respects the fifteen-year maturity limit.[272] In Pennsylvania the constitution was amended to permit creation of a 500 million dollar conservation and reclamation fund.[273]

Assuming that they can overcome these debt restrictions the states are faced with two related questions: Should the states acquire title to the land upon which the project is being constructed? and if they do not, should the states assess the private landowners for the value of the project constructed on his land? With reference to most publicly constructed capital projects these questions answer themselves. When the state constructs a sewage treatment plant or a bridge, it takes title and assumes possession of the land involved as a concomitant to maintenance and operation. Mine acid treatment facilities, such as the pilot plants constructed in Pennsylvania pursuant to Operation Yellowboy, fit within this model. But mine seal projects do not present the same necessity since all that is needed is access during construction and an opportunity for periodic maintenance thereafter. Likewise, the appetite of the states for recreational lands and open space is unlikely to be great enough to justify public ownership of all surface mined land which is restored.

When a municipality constructs a sidewalk it does not usually acquire title to the land used, but the cost is typically assessed to the landowner on the theory that he is benefitted. This assessment is often treated as a lien against the property which may be collected when the property is transferred, if not previously paid. Similar treatment of public costs occasioned in construction of mine seals or in reclamation of surfaced mined land would have a significantly different economic impact. The cost of sidewalk construction is ordinarily small when juxtaposed against the overall value of the benefitted land. But the cost of a mine seal or surface reclamation is often greater than the value of the benefitted land. The Federal Water Pollution Control Administration estimates $600 to $2000 per seal with an average of $1300; Department of Agriculture sources estimate the cost of restoring stripped land at between $1800 to $3000 per acre.[274] Considering that maximum value of Appalachian farm land is probably less than $50 per acre acre,[275] the magnitude of this gap becomes clear. Hence, assessment of costs against private landowners and enforcement through liens on the land) would indirectly result in large-scale public acquisition of the land through foreclosure.

The foregoing serves as background for the constitutional dilemma which states face when directly investing in abatement and reclamation projects. Water in more than 5,000 miles of streams in Appalachia are polluted by acid mine drainge; 800,000 acres of Appalachian land have been disturbed by strip mining.[276] State government may wish to acquire property rights to much of the land and water as part of the reclamation and abatement process for essential use as parks or recreational areas. But it is obviously neither desirable nor politically feasible for government agencies to acquire and keep all the land and water. With reference to the surfeit, the states have a choice -- they may either initially acquire the private property rights involved and then sell them back to the private sector after the abatement or reclamation is completed, or merely with the permission of the private property owners, enter and complete the project without property transfers. Both alternatives present constitutional difficulties. If the state takes property with an intention to later transfering it back to the private sector, constitutional questions arise as to whether the taking was for a "public use;" if the state engages in abatement or reclamation without acquiring the private property interests involved, the questions arise as to propriety of the conference of betterments on private landowners.

1. Public Use

The United States Constitution does not contain an express provision which prohibits the states from taking private property for any purpose other than public use. A reference to "public use" is contained in the Fifth Amendment ("nor shall property be taken for public use, without just compensation") but it is well established that this provision only applies to the Federal Government and is not applicable to the states.[277] However, the "public use" notion has been imputed into the Fourteenth Amendment which does apply to state action.[278] Therefore, as a matter of federal constitutional law, a state may employ the power of eminent domain only when the taking is to be for a "public use."

Problems arise with the definition of the word "public use." Text writers indicate that there are two views as to the meaning of the term. The narrow view insists the meaning to be:

> "..'use by the public', that is public service or employment, and that consequently to make a use public a duty must devolve upon the person or corporation seeking to take property by right of eminent domain to furnish the public with the use intended, and the public must be entitled as of right, to use or enjoy the property taken. The term implies the 'use of many' or 'by the public.'"[279]

The more liberal view contends that it means:

> "...'public advantage,' and that anything which tends to enlarge the resources, increase the industrial energies, and promote the productive power of any considerable number of the inhabitants of a section of the state, or which leads to the growth of towns and the creation of new resources for the employment of capital and labor, manifestly contributes to the general welfare and the prosperity of the whole community and giving the constitution a broad and comprehensive interpretation, constitutes a public use."[280]

Considering these two viewpoints it would seem that the narrow interpretatian would not allow the taking of property for abatement or reclamation purposes and then sale to private individuals. But arguments can be made that such action falls within the broad view of "public use."

For the last 75 years the Supreme Court has adopted the liberal view and been satisfied if the governmental action be justified as fulfilling a "public purpose." For example, in *Fallbrook Irrigation District v. Bradley*[281] decided in 1896, the court upheld imposition of assessments on private property for the purpose of creating irrigation districts since the irrigation of acid lands serves the public interests. And in *Berma v. Parker*,[282] decided in 1954, the court upheld the constitutionality of the condemnation of land in the District of Columbia for urban renewal purposes, notwithstanding the fact that plans provided for sale or lease-back of the land to private parties, after redevelopment.

The constitutionality of exercises of the condemnation power are likewise subject to review under state constitutions. The constitutions of the four states, with varying degrees of explicitness, limit exercises of condemnation power.[283] Since the Fourteenth Amendment merely establishes minimum requirements, the state constitutions also must be reviewed to determine whether they take a more restrictive view as to what constitutes a permissible use of the power of eminent domain.

Maryland

The Maryland Constitution contains a specific provision which sets forth the requirements for the exercise of eminent domain:

> "The General Assembly shall enact no Law authorizing private property, to be taken for public use, without just compensation, as agreed upon between the parties, or awarded by a Jury being first paid or tendered to the party entitled to such compensation."[284]

The case law has consistently assumed that this provision precludes taking for a private use,[285] but there has been some vacillation as to what constitutes a public use.

Prior to the turn of the century the Maryland Court of Appeals said:

> "The term 'public use' is flexible and cannot be confined to the use known at the time of the framing of the Constitution. All improvements that may be made, if useful to the public, may be encouraged by the exercise of eminent domain. Any use of anything which will satisfy a reasonable public demand for facilities, for travel, for transmission of intelligence, or of commodities would be a public use."[286]

Despite the breadth of this language, in subsequent cases the court has limited the condemnation power to instances where the public could physically use what was taken. The court justified adoption of the narrower definition with the following statement:

> "In this State we have held that the words 'public use' as written in our Constitution, mean use by the public. We hold this view for three reasons: (1) It is the primary and more commonly understood meaning of the words. (2) At the time of the adoption of the second Constitution of 1851, the first of our organic instruments to contain a limitation upon the power of

> eminent domain, as well as the third Constitution of 1864 and our present Constitution of 1867, there was no practice in Maryland showing a contemporaneous construction that the term 'public use' imported public benefit. (3) Our definition furnished a more definite guide for the courts."[287]

This circumscription on the power of eminent domain has in the past interfered with public works projects. When the City of Baltimore decided to engage in urban renewal activities (involving acquisition, improvement and sale of blighted property) an amendment to the Maryland Constitution was necessitated.[288] Although under this constitutional provision "the fact that after the taking the property may be put into private hands does not destroy the public character of the taking insofar as that taking may accomplish a proper public benefit,"[289] the provision is of no help in plotting abatement and reclamation strategies, since it only applies to Baltimore City.

In its most recent pronouncement the Maryland Court of Appeals has reaffirmed that in contexts other than urban renewal in Baltimore City the Constitutional "test of public use...was and is use by the public, rather than use benefiting the public."[290] Hence, in Maryland a constitutional amendment would seem prerequisite to an abatement or reclamation program involving transfer of the restored areas back to the private sector.

Ohio

The Constitution of Ohio contains the following provision:

> "Private property shall ever be held inviolate but subservient to the public wel-

> fare. When taken in time of war or other public exigency, imperatively requiring its immediate seizure or for the purpose of making or repairing roads, which shall be open to the public, without charge a compensation shall be made to the owner, in money, and in all other cases, where private property shall be taken for public use, a compensation therefore shall first be made in money, or first secured by a deposit of money; and such compensation shall be assessed by a jury, without deduction for benefits to any property of the owner."[291]

Case law indicates that this power of eminent domain cannot be exercised to take private property for a private use,[292] but the question remains as to what constitutes a public use.

In early decisions the Supreme Court of Ohio interpreted the phrase "public use" to mean use by the public. For example, in Pontiac Improvement Co. v. Board of Com'rs, decided in 1922, the court struck down an attempted expropriation with the following statement:

> "...Where private property is taken against the will of the owner under the power of eminent domain, it is prerequisite that possession, occupation, and enjoyment of the property by the public or by public agencies is sought and is necessary.
>
> "The natural import of the

> words, 'taken for public use,' used in our Constitution, is that the thing is to be used by the public or by some public agency for the public."[293]

The Ohio Supreme Court broadened its definition of public use in 1953. In State v. Rich[294] the court dealt with the constitutionality of a Cincinnati urban redevelopment project. Under the project the city was to acquire all the land in the project area, demolish and remove existing buildings, conduct certain improvements and make the land available for redevelopment by private enterprise or public agencies. The city could sell, lease or retain the land. Certain city officials refused to execute a necessary loan for project on the grounds that it was an illegal expenditure of public funds. The principal contention of the officials was that urban redevelopment was not a public use for which public funds could be expended and the power of eminent domain exercised. It was argued that the taking was for a private use since the land appropriated was to be subsequently turned over to private parties who would use the land for private purposes and profit.

The Supreme Court first turned to the meaning of the words "public use." The court stressed the first sentence of Article I, section 19:

> "Private property ought and shall ever be held inviolate, but always subservient to the public welfare, provided a compensation in money be made to the owner."

Great emphasis was given to the use of the word "public welfare," and the court concluded that the latter use of the phrase "taken for public use" in section 19 meant the same as "taken for the public welfare." Pontiac Improvement Co. v. Board of Comm'rs was then overruled to the extent it conflicted with this view.[295] Subsequent cases have reaffirmed that all that need be demonstrated to justify an expropriation is a nexus between the governmental program and a legitimate public goal. Hence, in Ohio it seems clear that it is constitutionally permissible to use condemnation powers in reclamation and abatement projects even though the bulk of the property taken will be subsequently sold back to private owners.

Pennsylvania

The Constitution of Pennsylvania contains the following provision dealing with the power of eminent domain:

> "...nor shall private property
> be taken or applied to public
> use, without authority of law
> and without just compensation
> being first made or secured."[296]

As in other constitutions there is no express prohibition against the taking of private property for a private use, but the cases indicate that it cannot be done.[297]

The Supreme Court of Pennsylvania's interpretation of the term "public use" is subject to the same vicissitudes as it is in Maryland and Ohio. The earlier cases seem to adopt the narrow interpretation of "use by the public," whereas the later cases seem to have swung towards the more liberal view of public benefit. It is perhaps best to look at both lines of cases in order to best determine what the Supreme Court of Pennsylvania's present approach is likely to be.

The strictest expression of the narrow interpretation of the term "public use" is contained in Pennsylvania Mut. Life Ins. Co. v. City of Philadelphia.[298] The city of Philadelphia was building a parkway under a state statute which authorized the appropriation by cities of private property for building parkways. Pursuant to this authority the city passed an ordinance expropriating certain property bordering the parkway. The ordinance authorized the Mayor to sell the condemned land to Bell Telephone subject to certain use restrictions.

The Supreme Court of Pennsylvania started off by declaring that private property could only be taken for a public use. It went on to define "public use" as being restricted only to "use by the public." In justification the court observed that if they were to adopt the broader view there would be "no limit to the power of either the legislature or the courts to appropriate private property to public use, except their individual opinions as to what is and what is not for the public advantage and utility." The court then held the use contemplated was not a "public use" since the city was not to own the land and had only very limited control over it.[299]

However, when the same question rose in the urban renewal context the court adopted the opposite tack. Following World War II, legislation was passed establishing a Philadelphia Housing Authority with authority to engage in slum clearance. It was contemplated that the Authority would acquire property by either purchase, gift, or eminent domain and improve it, or transfer it to a redeveloper, who could be individuals, partnerships, or public or private corporations. It could also borrow from private lenders or from government funds. Plaintiff attacked the constitutionality of this scheme.

One of the objections to the constitutionality of the law was the feature that allowed the sale of the property acquired by eminent domain. It was claimed that would be taking property from one individual and giving it to another. The Supreme Court of Pennsylvania pointed out that this did not violate the "public use" restriction. The public purpose did not require continuing ownership by the Authority, for it consisted of clearance, reconstruction and rehabilitation of the blighted area. Once this was accomplished the public purpose would be completely realized. The court said:

> "When, therefore, the need for public ownership has terminated, it is proper that the land be re-transferred to private ownership, subject only to such restrictions and controls

> as are necessary to effectuate the purpose of the act. It is not the object of the statute to transfer property from one individual to another; such transfers, so far as they may actually occur, are purely incidental to the accomplishment of the real or fundamental purpose."[300]

The court, furthermore, pointed out that if the public good is enhanced, the taking does not lose its public character merely because there is some element of private benefit in the operation.

Most recently, in 1968 the Pennsylvania Supreme Court reaffirmed its proclivity to permit condemnation of land if concomitant to reasonable public work projects.[301] Hence, it appears likewise likely that expropriations for abatement or reclamation purposes would pass constitutional muster notwithstanding plans to eventually transfer the property involved back to the private sector.

West Virginia

Article III, section 9 of the West Virginia Constitution contains the following provision:

> "Private property shall not be taken or damaged for public use, without just compensation... and when private property shall be taken, or damaged for public use, or for the use of such corporation, the compensation to the owner shall be ascertained in such manner, as may be prescribed by general law."

In the 1883 case of Varner v. Martin, the West Virginia Supreme Court determined that this language precluded the expropriation of property for anything other than use by the public.[302] The court went on to find that a public use ordinarily involved giving the general public physical access to the taken property and not merely some "public utility or usefulness in its most general sense."

Subsequent cases decided in the early 1900's reaffirmed this restrictive definition of a "public use." For example, in Hence v. Pritt the court said:

> "...the use which the public is to have of the property condemned must be fixed and definite, and the general public must have a right to a definite and certain use thereof."[303]

Since 1914 there have been no reported West Virginia condemnation cases defining "public use." All of the cases that arose before that point in time dealt with the propriety of delegating expropriation powers to private or semi-private businesses. Abatement and reclamation projects raise a distinguishable problem since the actual condemnation will be by an admittedly public agency and the public use issue only arises because of plans to eventually transfer the property back to the private sector.

The dearth and distinguishable nature of these authorities leaves open the constitutionality of condemnation-reclamation-re-sale type projects. Several factors can be developed in their favor. First, in dicta long ago the court determined that there is a presumption of correctness in favor of a legislative determination as to what constitutes a public use.[304] Second, urban redevelopment legislation which likewise fits within the above model, has existed in West Virginia for two decades without effective challenge.[305] Hence, in West Virginia, the propriety of condemnation proceedings pursuant to abatement and reclamation is in doubt.

2. Conferring Betterments

In Ohio, Maryland, and Pennsylvania as a legacy of the previously discussed canal and railroad "boom and bust," there are constitutional limitations on the extent and manner in which private landowners may be benefitted. The provisions in the constitutions of Ohio and Maryland are similar. Both attempt to preclude state subsidization of private business by prohibiting the state from giving or lending its credit to such concerns.[306] In addition, indirect subsidization is precluded in Maryland by a prohibition against constructing "internal improvements," and in Ohio by a prohibition against the state's borrowing money to construct "internal improvements."[307] Pennsylvania has a less pervasive constitutional provision which prohibits the state from serving as a surety for, or investing in private businesses.[308] West Virginia has only the blanket prohibition against debt incurrence which has been previously discussed.[309]

These provisions, if literally enforced, could significantly limit the ability of the states to deal with the problems of mine acid and surface scars. Maryland, Ohio and Pennsylvania are ostensibly precluded from dealing with these problems through incentives, grants or guarantee of loans for private operators. The case law, however, has in some measure removed the bars. The Maryland Court of Appeals has upheld the constitutionality of legislation creating a Maryland Industrial Development Authority with power to insure payment of mortgage loans used for privately held industrial projects, so long as the credit of the state does not stand behind the promise to insure payment.[310] In Pennsylvania the Supreme Court upheld the constitutionality of an industrial development authority with power to directly finance construction of private industrial facilities through issuance of tax-exempt state revenue bonds on the theory that such bonds did not constitute a debt of the state.[311] The Ohio and West Virginia courts have likewise accepted the revenue bond as a method for permitting state incentives without incurring state "debt."[312]

The additional provisions of the Ohio and Maryland constitutions present special problems. The Ohio constitution explicitly provides that "the state shall never contract any debt for purposes of internal improvement."[313] When the Ohio legislature created a Development Credit Corporation with authority to provide incentives to private industry it did so through passage of a constitutional amendment.[314] Therefore, a constitutional amendment would likewise be a prudent precedent to any state financing role in surface reclamation, sealing or construction of mine acid treatment facilities.

Similar problems are broached by the language of the Maryland Constitution prohibiting state involvement in construction of "works of internal improvement."[315] Literally construed, this language would seem to preclude any state role, direct or indirect, in reclamation and abatement activities, but the case law indicates to the contrary. Over the years the Maryland Court of Appeals has emasculated the provision by finding the following not to be "works of internal improvement:" public roads;[316] drainage and sewage systems;[317] bridges;[318] universities;[319] hospitals.[320] The court limited the term to railroads and canals, those works which:

> "...were such as the State has been connected with or interested in as 'stock-holder,' or 'creditor' -- such as had driven it to the very verge of bankruptcy and repudiation-- and not such as every State government must have, either in its own name or in the names of its 'political agencies, created for the better government of the affairs of the State'...."[321]

Within this definitional framework it is easy to justify the constitutionality of abatement and reclamation activities by the State of Maryland.

Hence, all four states have anachronistic limitations on legislative powers, coupled with judicially developed means of avoidance. Notwithstanding the availability of this evasionary tactic there are several advantages to constitutional amendment as a preliminary to public expenditures to eliminate the external effects from coal mines. First, most of the evasionary tactics involve the use of revenue bonds payable from an earmarked revenue source rather than from general revenues. The use of revenue bonds rather than full faith and credit bonds may significantly increase the cost of borrowing.[322] Second, since all of these tactics involve a high degree of judicial casuistry and a low degree of judicial candor they are unreliable until specifically approved. Although courts in past contexts may have said that the debts of a legislatively created authority are not debts of the state, that the legislatively authorized issuance of bonds repayable from the revenue from the turnpikes, bridges, or treatment facilities does not constitute creation of a state debt, and that sewage treatment facilities, hospital and highways are not works of internal improvement, there is no guarantee that they will continue these conceits into the future.

There is another restraint on state acid abatement activities on privately held land in addition to these constitutional strictures. Section 14 of the Federal Water Pollution Control Act provides for 75% federal funding of acid or mine water pollution demonstration projects. An express condition to the availability of federal funds provides:

> "that the State or interstate agency shall provide legal and practical protection to the project area to insure against any activities which will cause future acid or other mine water pollution."[328]

Although the question of exactly what constitutes "legal and practical protection" remains unanswered, certainly one way in which the states can provide it is through continuing public ownership of the area.

VII

COAL MINING IN MARYLAND: AN ECONOMIC CASE STUDY

A. Introduction

In the present public debate over the appropriate legal response to the environmental problems resulting from coal mining, conflicting, sometimes strident, views may be heard. Spokesmen for the coal industry, while admitting the need for some minimal state intervention, decry both the possibility of federal laws and the ability of the coal industry to pay the price of stringent abatement and reclamation procedures. Carl E. Bagge, President of the National Coal Association, has noted that the states rather than the federal government should be encouraged to enact laws requiring reclamation following surface mining since state authorities are most familiar with their particular areas of concern and best qualified to establish specific criteria.[324] John W. Mullan, the environmental affairs director of the National Coal Association, has said that mining pollution standards are too strict and that:

> "it is easy to say that industry should pay the research and operating costs of cleaning up its own pollution, but industry doesn't have unlimited funds for pollution abatement any more than government does."[325]

The frontal attacks on the mining industry have been directed more at surface mining than at underground mining. The choice of the primary target appears less a product of analysis of the comparative environmental ills of the two coal-taking methods than a response to the high degree of visibility of surface scars. Arguments can be made that surface mining results in the lesser of the two sets of environmental evils: surface mining results in the effective taking of a significantly greater percentage of the usable coal than does underground mining; surface mining presents significantly fewer safety hazards to miners -- fewer cave-ins, black lung disease and explosions; more than 71% of the acid drainage in Appalachia comes from underground mines.[326]

But there is no denying the ugliness that follows as an aftermath of surface mining operations. Environmental Action magazine has characterized strip mining as "an ecological catastrophe."[327] The Wall Street Journal has poetically discussed the effect of stripping on the Ohio Valley as follows:

> "Hundreds of acres, often as
> far as the eye could see,
> were chewed up and spit out
> by giant power shovels,
> leaving a terrain of jagged
> rock, deep trenches and
> mountains of raw, desolate
> earth."[328]

Opponents of surface mining likewise downgrade the effectiveness of reclamation work pointing out that some 3000 square miles of America have been strip mined and only about one-third of this land has been given any reclamation at all.[329] Moreover, their attitude toward reclamation work when done is well summed up by Ohio Governor John J. Gilligan who termed reclamation work as "cosmetic treatment which leaves land useless for recreation or anything else."[330]

B. Ambit of the Study

The aim of this study is to subject several of the propositions found in the public debate, to economic examination. First, will imposition of the costs of pollution abatement reclamation on the mining operations cause severe financial hardship on the industry and result in substantial curtailment of production? Second, is the best way to deal with pollution and aesthetic degradation caused by coal mining, to simply prohibit coal mining?

It is important to clearly anticipate the limitation implicit in the study. The data used related only to the bituminous coal industry in western Maryland. The Maryland coal industry differs substantially from the industry in Ohio, Pennsylvania and West Virginia. It is not a large industry, producing less than one half of one per cent of the bituminous coal mined in the United States and employing less than 0.02 per cent of the total Maryland work force. In addition, the mining operations are themselves small in scale and use relatively small equipment. While in the Ohio flat coal lands a drag line can gulp out 250 cubic yards in a single scoop, Maryland drag lines have a maximum capacity of 12 cubic yards. Hence the transfer value of economic conclusions based on the Maryland data is problematic.

Moreover, the conclusions to be drawn from the economic analysis are themselves limited. At the root are always choices between basic societal values which must be politically (not economically) resolved. Notwithstanding these limitations it is hoped that the study has value. It establishes a methodology which may be employed in analyzing the coal industries in other states. Most important, it more precisely frames the questions -- segregating perceived economic effects from the basic value choices lurking beneath.

At this point a brief statement of the organization of the chapter may be helpful. Immediately following is a brief introduction to the economic terms to be used. Next is an overview of the Maryland coal mining industry and recent pollution abatement legislation. Following the overview, the chapter deals with general industry characteristics such as production, employment, revenue and costs. The ensuing section contains a discussion of the mining external diseconomies and the legislation designed to internalize them. It is divided into three subsections. The first presents the mining external diseconomies, the second discusses the legislation and gives our estimates of the costs imposed on the operators by the law, while the third draws together the material from the preceding sections and presents our assessment.

C. Economic Terminology

The following interrelated economic concepts are useful in analyzing the relationships among the coal industry, environmental pollution and recent abatement legislation: "external economies" and "external diseconomies," or simply "externalities." External economies or diseconomies are benefits or costs affecting parties not immediately involved in a particular process and over which they have no direct control. They are called externalities because they operate outside the direct economic considerations of those who cause them. The classic example of an external economy is that of the beekeeper and his neighbor, the apple grower. The bees, in gathering nectar, pollinate the apple blossoms. Thus, the beekeeper by locating his hives near the orchard helps to confer an external economy on the apple grower since, of course, the apple grower does not pay for the pollination services of the bees. The classic example of an external diseconomy is air pollution in the form of smoke from a factory. The smoke may impose real costs on the surrounding countryside in terms of increased cleaning expenses, poorer health, damaged vegetation, etc., but these costs do not appear on the accounting books of the factory. The salient characteristic of externalities is that they provide real benefits or impose real costs on third parties but these benefits or costs are not directly considered in the economic calculations of the one who produces them.

Externalities are particular problems with "common property" resources. Common property resources are those over which no one has exclusive property rights. The atmosphere, water in a stream, most oil deposits and the stock of wild animals are common examples. An example of an external diseconomy related to a common property resource occurs when a person upstream dumps waste into the stream thereby damaging property and/or imposing larger water treatment costs on the downstream user.

These particular types of externalities arise because of a given institutional structure. Institutional structure refers to the complex of laws, rules, regulations and customs within which social, political and economic activities operate. By changing the institutional structure, one can frequently force the producer of an external diseconomy to "internalize" the costs, i.e., bear the burden of reducing the externality, so that the costs become part of his direct economic calculations. By way of summary, if a legislature passed a law requiring mine operators to treat polluted mine water before discharging it into a stream, an economist might say that the government had changed the institutional structure to force the mine operators to internalize an external diseconomy associated with a common property resource.

D. Overview

In Maryland today, commercial bituminous coal mining is conducted exclusively in Allegany and Garrett counties -- the two westernmost counties of the state sandwiched between Pennsylvania on the north and West Virginia on the west and south. The North Nranch of the Potomac River forms the boundary between Maryland and West Virginia downstream from Kempton, Maryland until it is joined by the South Branch to form the Potomac River. A federal report has described these coal lands as follows:

> "The coal bearing area of the North Branch basin lines in a continuous trough-shaped valley about 80 miles long, oriented in a northeast-southwest direction. The North Branch flows northeast through the center of the basin for almost two-thirds of its length. The northeast part of the valley is drained by Georges Creek, which flows southwest through the center of the valley to join the North Branch at Westernport. The coal-bearing region southwest of Westernport is known as the Upper Potomac coal fields. The coal region drained by Georges creek, Savage River, and two small tributaries of Wills Creek is known as the Georges Creek coal field. Coal is mined from the Pittsburgh,

> Tyson, Bakerstown, Waynesburg, Freeport, and Kittanning coal seams.
>
> "Coal has been mined in the North Branch basin for about 150 years. Maryland's peak production of coal occurred in 1907, earlier than any other major coal-producing state."[331]

Presently, coal is mined by all three major production methods -- underground, strip and auger. Total 1970 production was 1,467,003 tons while total employment was 361.[332] Neither this production nor that of the preceding decades was costless. Some of the benefits and costs of producing coal have been reflected through the years in the price at which coal was sold. However, because of the market imperfections which economists have dubbed external economies or diseconomies, not all the benefits and costs of coal production have been reflected in the market price because these externalities do not directly enter the cost calculations of the producer or purchaser in question.

As another example of this concept, let us take an external diseconomy associated with past coal production. As mentioned above all production costs have not always been included in the market price. Thus, in making his cost calculations, the coal producer considered the costs of lumber and labor as well as the costs of equipment and entrepreneurship but not the costs to the environment. Until fairly recently, nearly everyone considered the assimilative capacity of the environment to be a "free" common property resource. But when this assimilative capacity was exceeded, society did not have a well-organized framework with which to deal with the problems thus created.

Therefore, the coal producer did not consider the costs to the environment because neither market forces nor the existing institutional structure required him to do so. In an attempt to require the coal producers to "internalize" these diseconomies, governments passed new legislation concerning environmental pollution.

The State of Maryland has had laws dealing with environmental pollution for some time. However, in 1967 a revision of the laws dealing specifically with strip and auger mining established a Land Reclamation Advisory Committee and placed more emphasis on environmental considerations. This subheading was revised in 1969 and again in 1971. In addition to the Land Reclamation Committee and requirements for licenses, permits and reports, the present law provides for a general reclamation bond of $400 per acre of land affected, a revegetation bond of from $50 to $125 per acre depending on conditions and a reclamation fee of $30 per acre to be deposited in the Bituminous Coal Open Pit Mining Reclamation Fund. The state also has laws establishing water quality standards and controls on sedimentation. All these laws provide penalties for failure to comply. Since we are interested in the effects of such legislation, we will be dealing with data from the last half of the 1960's and 1970. The following section presents a more detailed picture of the Maryland coal mining industry.

E. Industry Characteristics

One of the most striking facts about the bituminous coal industry in Maryland is that it is relatively insignificant in terms of total United States production of bituminous coal. In the second half of the 1960's, Maryland produced less than one-half of one per cent of the bituminous coal mined in the United States.[323] Total production grew from 1,195,787 tons in 1965 to 1,467,003 tons in 1970. This indicates an average annual growth rate of 4.2%. In this period strip mining became increasingly important while the relative share of deep mining declined. From 1965 to 1970 strip mining grew from 63% to 76% of total production while other methods, mainly deep mining, declined from 37% to 24% of production.[334]

Another important item to note is employment in coal mining. Again the figures are unimpressive. The industry, in Maryland, employed 405 persons in 1965. This figure decreased to 361 in 1970. Much of the decline is explained by greater mechanization which has caused productivity to rise from 2953 tons per man in 1965 to 4064 tons per man in 1970.[325] To give some perspective, coal mining only accounted for about 0.02% of total employment in Maryland in 1970 while contributing no more than 1.5% to employment in Garrett and Allegany counties where all of the coal mining takes place.[336]

Having presented the general dimensions of the industry, we now wish to estimate the benefits and costs arising from coal mining in Maryland. As a conservative measure of benefits, we have used the total revenue generated by coal sales. We do this for the following reasons.

Total revenue to a producer is calculated by multiplying the quantity of the good sold by the price of the unit of the good sold. This definition appears straightforward; however, the unit price of the good needs some interpretation. An individual is willing to pay an amount equal to the benefits he derives from consuming a unit of a particular good. It is also generally true, from the law of diminishing marginal utility, that, after some point, the benefit derived from each additional unit of a good consumed is less than that derived from each of the preceding units. (The third piece of pie provides less satisfaction than the first.) As a result, the amount an individual is willing to pay for additional units of a good declines. These facts are summarized in an individual's demand curve for a good. A demand curve shows the quantity of a good demanded at alternative prices. Inversely, it shows the amount an individual is willing to pay for each successive unit of a good, which is to say it shows the marginal benefits derived from each additional unit of the good.

As a simple example, consider Figure 1 in which we have an individual's demand curve for a good (line dd).

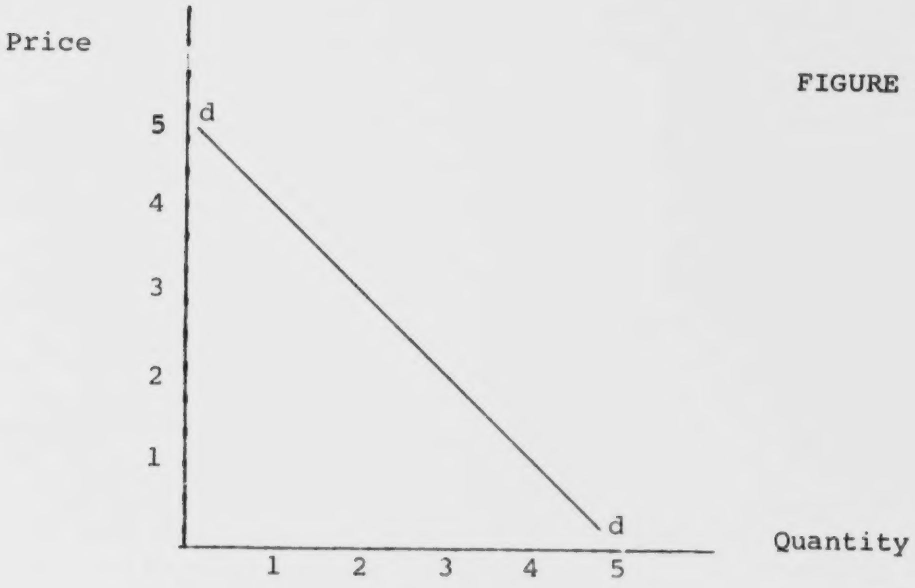

FIGURE 1

We measure price on the vertical axis and quantity on the horizontal axis. We can see that at a price of $5 the individual demands one unit. This also means that the individual derives benefits worth at least $5 from the first unit of the good he consumes. We can see that at a price of $3 the individual demands three units of the good and also that the individual derives benefits worth $3 from the third unit consumed. Now suppose the producer of the good has determined that to maximize profits, he should sell the individual three units. In order to get the individual to buy the third unit he will charge a price of $3 for that unit. But since all of the units are interchangeable he can only charge a price of $3 for the first and second units even though the buyer would have been willing to pay $5 and $4 for the first and second units respectively. So the unit price for all units is $3 and this reflects the marginal benefit of the last unit. In this case the producer has a total revenue of $9 ($3 x 3 units) but the buyer derives benefits worth $12 ($5 + $4 + $3). We can now see that if the demand curve is downward sloping, total benefits must be worth at least as much as the total revenue obtained by the producer.

Therefore, as a minimum measure of benefits, the total revenue for the Maryland coal industry has been calculated for each year from 1965 to 1970. These figures as well as quantities and average yearly prices appear in Table 6.

TABLE 6

PRICE, QUANTITY AND REVENUE OF MARYLAND COAL INDUSTRY: 1965-1970

	1965	1966	1967	1968	1969	1970
Price/ton (dollars)	3.63	3.57	3.48	3.67	3.83	5.00
Quantity (tons)	1,195,787	1,210,051	1,319.318	1,390,645	1,381,645	1,467,003
Total Revenue (dollars)	4,349,654	4,328,463	4,602,441	5,103,668	5,293,469	7,335,015

The quantities are those reported in the annual reports of the Maryland Bureau of Mines. The 1965 to 1969 prices are the weighted average of the value of coal, f.o.b. the mine, for Garrett and Allegany counties as reported in the U.S. Bureau of Mines Minerals Yearbook.[337] These values are weighted by county production figures of the Maryland Bureau of Mines to yield the total revenue figures. The 1970 price is an estimate based on preliminary data from reliable sources. The jump from the 1969 price of $3.83 per ton to the 1970 price of $5.00 per ton is fairly dramatic but it was a trend that was experienced by the entire coal industry. This was partially a result of inflationary pressures in the economy as a whole but was mainly a result of increased demand, especially foreign demand for coal of all grades. In 1965 around 50 million tons of coal were exported. In 1969 this had risen to only about 56 million tons but jumped to almost 71 million tons in 1970.[338] The price has now leveled off somewhat and people in the industry report that through the first half of 1971 Maryland coal was selling for around $4.50/ton.

Opposed to benefits we have the costs of production. These costs, in competitive markets, are a measure of benefits that society foregoes by having productive inputs producing a particular good instead of some other good. This can be seen if one considers that to keep inputs in a particular employment that employment must pay them at least as much as they could make in their best alternative employment. Income in the alternative employment would reflect a factor's contribution to revenue and revenue, as we have seen, is a rough measure of benefits. So costs, like revenues, are a measure of benefits but in this case benefits foregone.

The estimated cost per ton and total cost coal operators in Maryland paid in each of the years 1965 to 1970 appear in Table 7. These costs presumably include pollution abatement and reclamation costs, since the major legal standards were in effect in 1967. More will be said about this in the next section.

TABLE 7

OPERATING COSTS OF MARYLAND COAL INDUSTRY: 1965-1970

	1965	1966	1967	1968	1969	1970
Cost/ton (dollars)	2.81	2.95	3.11	3.26	3.43	3.60
Total Cost (dollars)	3,360,161	3,569,650	4,103,079	4,533,503	4,739,042	5,281,211

The base for these calculations was the costs for Maryland coal mining reported in the 1967 Census of Mineral Industries.[239] Dividing by quantity we determined a cost per ton and on the assumption that this cost was growing at about five per cent per annum during the period we were able to derive a cost per ton for each of the respective years. Multiplying cost per ton by each year's quantity gave total cost.[240]

The last item or the Maryland coal industry to consider in this section is profit. Profit is the excess of revenues over costs. However, part or all of what we call profit is in fact a cost as it is the necessary return needed to keep a coal operator's organizational abilities and financial resources committed to coal production and it is a legitimate part of the supply cost of coal. The coal operator's return is calculated as an annual rate by taking profit as a percentage of financial outlay, i.e., costs. Profit and return to outlay are shown in Table 8. Of course, not all of the profit shown in Table 8 is a return to the operator as various taxes must be paid from this amount. In the following section some of the external diseconomies produced by the coal industry, and the Maryland legislation designed to internalize them are discussed.

TABLE 8

PROFIT AND RETURN OF MARYLAND COAL INDUSTRY: 1965-1970

	1965	1966	1967	1968	1969	1970
Before Tax Profit (dollars)	989,493	758,813	499,362	570,165	554,427	2,053,804
Rate of Return	29.4%	21.3%	12.2%	12.6%	11.7%	38.9%

F. Internalizing External Diseconomies

1. Diseconomies

As previously noted strip mining together with auger mining is accounting for a progressively larger share of total coal production in Maryland as well as nationally. An important reason for this trend is that strip and auger mining are extremely efficient mining methods in terms of tons produced per man per day. They are also safer than underground mining in terms of both fatal and non-fatal accidents per million man-hours exposure. In addition, strip mining is less wasteful than deep mining in the sense that it permits nearly all the coal in a particular seam to be recovered whereas underground mining requires that some coal be left for support.[341] However, both surface and deep mining produce several environmental problems which the recent Maryland legislation is designed to correct.

In disturbing the natural landscape, unreclaimed strip mines are eyesores and contribute to the aesthetic degradation of the environment. In addition, the loose, unsorted piles of overburden lead to increased soil erosion and sedimentation in the local drainage basin. Furthermore, the spoil piles contain material which is inflammable as is the exposed coal seam. Fires, once started in these areas, are very difficult to extinguish and result in air pollution and needless waste of resources. Both deep and surface coal mining may produce acid mine drainage. Acid drainage can render the receiving stream highly corrosive and taxic, thus limiting recreational, industrial and other benefits to be derived from the water.

2. Legislation and Costs Imposed

In an effort to deal with these problems, the State of Maryland now has legislation regulating strip and auger mining, and the effect on water quality of discharges and sedimentation. (At the date of this writing, October 1971, the State has not yet enacted effective deep mine legislation.) In order to strip mine, an operator must obtain a license, apply for and receive a job permit for the specific area he wishes to mine, post performance bonds for reclamation and revegetation, pay a special reclamation fee and make several types of reports. The license costs $100 initially plus $10 for annual renewal. To receive a job permit the operator must submit a map of the area as well as a detailed mining and reclamation plan showing the manner, time and distance for backfilling, drainage, planting and general reclamation of the area affected. This application must be reviewed and approved by the Land Reclamation Committee. The nine members of the Land Reclamation Committee are: the Director of the Maryland Geological Survey, who acts as chairman; the chairmen of the Soil Conservation District supervisors of Allegany and Garrett Counties or their designated representatives; two members appointed by the Governor to represent the mining industry or their designated alternates; and the Director or his representative of the following state agencies: Fish and Wildlife Administration, the Department of Forests and Parks, and Department of Water Resources and the Bureau of Mines. This committee studies, recommends and approves all procedures for reclamation, conservation and revegetation of areas affected by surface mining within Maryland.

The performance bonds are of two types -- a general reclamation bond and another limited specifically to revegetation. The general bond is $400 per acre of land affected with a minimum of $3000. The revegetation bond is from $50 to $125 per acre of land affected depending on conditions. Both bonds may be those of a corporate surety, cash, negotiable United States government securities or certificates of deposit of a Maryland bank. In addition to the bonds, the operator must pay a special reclamation fee of $30 for each acre of land affected to the Bituminous Coal Open Pit Mining Reclamation Fund. This fee is matched by the state and paid to the Fund. It also receives revenues from the license fees and bond forfeitures. The Fund is used by the Director of the Bureau of Mines for reclaiming and planting abandoned lands affected by surface mining of bituminous coal. The operator must also make monthly and annual reports of his operations. He reports on his progress in reclamation and planting and prepares a final report upon the completion of the entire operation. This report must be approved by the Land Reclamation Committee.

In addition to the above laws, the mine operator must comply with rules and regulations issued by the Maryland Bureau of Mines pursuant to the strip mining laws. These regulations spell out in detail the general requirements stated in the law.

By complying with the provisions of the legislation, the mine operators have reduced the environmental effects of surface mining. By restoring disturbed areas to nearly the original contour and planting vegetation, surface water courses are re-established, erosion and sedimentation are diminished and the quantity of water seeping to underground mines to reappear as polluted mine drainage is reduced. By burying sulfur-bearing material and low-grade waste coal as well as covering the exposed coal seam during backfilling, acid formation and the possibility of fires are greatly reduced. Finally, by backfilling, grading and planting, the mine operators help to restore the natural appearance of the landscape. The consensus of official and unofficial opinion is that reclamation efforts pursuant to the present strip mining law effectively combat mine acid drainage, and after the hiatus required for revegetation to take root, effectively restore the land to an aesthetically acceptable appearance.[342] But the economic question remains, how much have these efforts cost the mine operator?

The major costs imposed on the operators by the strip mining laws and regulations are those associated with backfilling and grading, with revegetation and with the reclamation fee. Other costs attributable to the law, such as licensing fees, additional mapping and surveying fees, additional reporting costs and the opportunity costs of the bonding requirement are probably relatively small when compared to the total costs of the operation. The opportunity costs of the bonding requirement merit an explanation. Most corporate sureties in Maryland charge only a one per cent fee on their bonds for strip mining. However, because of poor past experience, they require collateral in the amount of the bond. Thus, given the options open to him, the rational mine operator would choose to fulfill his bonding requirement with a certificate of deposit.

His opportunity cost of doing this is the difference between the amount of interest that the bank pays and what he could earn with the money if he could invest it as he wished.

The major cost items listed above have been estimated by contacting members of the industry and of the Land Reclamation Committee. The Maryland Bureau of Mines has contracted to have abandoned mines adjacent to current operations backfilled and graded. This procedure avoids the substantial expense of transporting heavy equipment to a site solely to backfill and grade an abandoned mine. An average of these contract fees yields a cost of approximately $400 per acre to backfill and grade in 1970. This estimate should be treated with some care since it is based on a sample of only seven observations which ranged from $120 to $1670 per acre. Conversations with industry representatives and soil conservation officials indicate that about $75 per acre was the average cost of revegetation in 1970. The reclamation fee is $30 per acre. Thus the major costs imposed by the laws may be estimated to have been about $505 per acre in 1970. Table 9 presents some estimates of reclamation costs for the period 1967-1970.

TABLE 9

ESTIMATED RECLAMATION COSTS TO MARYLAND COAL INDUSTRY: 1967-1970

	1967	1968	1969	1970
Acres Affected	287	554	388	390
Cost/acre (dollars)	435	460	480	505
Total Reclamation Cost (dollars)	124,845	254,840	186,240	196,950
Reclamation Costs as % of Total Cost	3%	5.6%	3.9%	3.7%

The costs per acre for 1967 to 1969 were derived by discounting the $505 for 1970 at a rate of 5% per annum (the rate at which we assume costs to be increasing and rounding to the nearest five dollars).

The Maryland water quality legislation must now be considered. Maryland requires a permit to discharge water-borne waste into state waters. Pollution of water so as to change its temperature, taste, color, turbidity, odor or normal pH value is thereby restricted. The main water pollutant associated with coal mining is acid mine drainage. To the extent that acid mine drainage does lead to a loss of benefits from other uses, it must be considered as a real cost of producing coal. But most waterways are common property resources and producers considered them to be free resources, so costs imposed on downstream users were not taken into account. In recent years, however, legislative action has enabled water quality standards to come into being. These standards help to avert damage to downstream users by forcing producers to meet water quality standards, thus "internalizing" these costs to the coal producing firm.

In reality, the costs imposed by these standards on active producers in Maryland are probably very small. Part of the reason for this is the level of pollution that can be attributed to active mines. In 1967, for instance, active mines in Maryland were responsible for only about four per cent of measured acidity in the North Branch of the Potomac, the rest coming from abandoned mines and active mines in West Virginia.343 In 1970 the Maryland Department of Water Resources, in its survey of the more than 70 active mines, found only fifteen with discharges and of these only five failed to meet water quality standards. In addition, these discharges were mainly from strip mines where, if acid drainage occurs, it is relatively easy to remedy. This can generally be done by relocation of some of the excavated material. When the strip operation is completed, the proper burial of sulfur-bearing material during backfilling essentially eliminates the danger of future acid drainage.

Abatement of acid drainage associated with deep mining is probably much costlier than for strip mining.

Here abatement would often entail water treatment while the mine is active and sealing when the mine is abandoned. The costs of treatment vary greatly depending on acidity, volume of discharge and other factors, but would generally be much more expensive than the remedies available to strip miners. The cost of sealing also varies a great deal depending on the particular circumstances of the mine involved but, based on past data on sealing, the cost of one seal was probably between $13,892 and $18,522 in 1970.[344] Since the purpose of sealing is to prevent oxygen and surface water from coming into contact with sulfur-bearing materials, all entrances to a mine require a seal. Maryland mine safety laws require a minimum of three entrances, so by using the lower cost of $13,892 per seal, one obtains a conservative estimate of $41,676 as the cost of sealing a deep mine. This is a substantial amount given the scale of Maryland mining operations. However, given the declining importance of deep mining, the low incidence of substandard acid drainage associated with present active mines and, in some cases, the alternative of strip mining, these costs would rarely be incurred. As a result, additions to industry costs are probably negligible. The same conclusion holds for strip mining. That is, given the low incidence of substandard drainage and the relatively simple remedies, the costs added to normal production and other reclamation costs by the water quality standards are insignificant because they are usually met by complying with the strip mining reclamation laws.

In order to control sedimentation, Maryland requires a grading and sediment control plan from a registered engineer to be approved by the local soil conservation district before building or mining operations can begin. Sedimentation is not a particular problem with deep mining. It was a problem with surface mining but current strip mining legislation and the attendant change in mining practices have reduced erosion and sedimentation resulting from the haulage roads used to bring the equipment in and haul the coal out continue to cause concern. The Land Reclamation Committee is currently considering the problem. With the possible exception of the haulage roads, however, the erosion control laws do not impose significant additional costs on the mine operators since they are usually satisfied by complying with the strip mining reclamation laws.

3. Assessment

Table 10 presents a summary of the data from the preceding sections for the period 1967-1970. An examination of the table will indicate that production has been generally increasing throughout the period as have prices and therefore total revenue. However, costs have also been increasing. Nevertheless, before-tax profits and rate of return have a generally upward trend. The high figures for 1970 are mainly attributable to the $5 price. As noted earlier the present price of Maryland coal has decreased to about $4.50. If the price does not decrease further (and we have no reason to believe that it will), the rate of return should remain at sufficiently high levels to retain the operators in the industry.

The number of acres affected by coal mining each year is variable but the estimated reclamation costs per acre, reflecting higher labor and materials costs, have been increasing. Reclamation costs vary relative to total costs due in large part to the variability in the number of acres reclaimed each year. However, reclamation costs average in the neighborhood of four per cent of total costs. Cost estimates were derived from the 1967 Census of Mineral Industries[345] and should reflect true total costs. However, inasmuch as the new reclamation laws were just beginning to have an impact in 1967, the total cost and the reclamation cost estimates have been summed in order to obtain conservative estimates of profit and rate of return. The 1967-69 figures would tend to indicate a marginal return. However, because they are based on a maximum cost estimate and given the handsome return in 1970 (which should not diminish greatly with current prices), the Maryland industry is probably earning a sufficient return.

TABLE 10

QUANTITY, PRICE, REVENUE, COSTS, PROFIT AND RETURN OF MARYLAND COAL INDUSTRY: 1967-1970

	1967	1968	1969	1970
Quantity (tons)	1,319,318	1,390,645	1,381,645	1,467,003
Price/ton (dollars)	3.48	3.67	3.83	5.00
Total revenue (dollars)	4,602,441	5,103,668	5,293,469	7,335,015
Cost/ton (dollars)	3.11	3.26	3.43	3.60
Total cost (dollars)	4,103,079	4,533,503	4,739,042	5,281,211
Before tax profit (dollars)	499,362	570,165	554,427	2,053,804
Rate of return (%)	12.2	12.6	11.7	38.9
Acres affected	287	554	388	390
Reclamation costs/acre (dollars)	435	460	480	505
Total reclamation costs (dollars)	124,845	254,840	186,240	196,950
Reclamation costs as % of total costs	3.0	5.6	3.9	3.7
Total costs and reclamation costs (dollars)	4,227,924	4,788,343	4,925,282	5,478,161
Before-tax profit (based on total cost and reclamation cost) (dollars)	374,517	315,325	368,187	1,856,854
Rate of return (%) (based on total cost and reclamation cost)	8.9	6.6	7.5	33.9

G. Evaluation

Based upon the above analysis, answers can be tentatively advanced to the two questions which were originally asked. First, will imposition of the costs of pollution abatement and reclamation on mining operations cause severe financial hardship to the industry and result in substantial curtailment of production? The analysis answers this question with a no. The industry is still thriving after four years of internalizing the costs of reclamation. In response to the 1970 rate of return some operators are buying new equipment. But several caveats must be added. Due to present inadequacies in Maryland's laws mining operators may not be effectively forced to internalize the costs of remedying acid mine drainage. More important, the above analysis has taken no account of the possibility that evolving air quality standards may indirectly depress the value of coal with a high sulfur content.

Second, would prohibition be the best way to deal with pollution and aesthetic degradation caused by coal mining? Again our analysis answers the question with a no. Even after reclamation costs are added to production costs the coal industry produces profits and may be therefore socially useful. But as is frequently the case, the conclusiveness of the analysis is limited by the lack of appropriate data. Because of data limitations, only conservative estimates of the major costs and benefits have been presented. Thus the additional costs to the Bureau of Mines and other government agencies of implementing and overseeing the application of the new laws were not explicitly considered. Costs may also be attributed to the severe, though temporary, degradation of the region's scenic values which accompanies on-going mining operations. To the extent that subsequent rehabilitation fails to fully restore these values, some residual degradation may persist. The damage to the roads of the area resulting from the movement of heavy equipment and transportation of coal is yet another example of the costs which were not explicitly considered.

Similarly, the benefits provided by the indirect employment generated by the industry in the local consumer market were not estimated; neither was the industry-generated employment on the railroads nor in the Port of Baltimore. The benefits of tax revenues from the industry were not considered.

It is a function of legislative bodies to quantify the unquantifiable. However, in deliberating a particular issue, it is incumbent on the legislators to consider fully the values assigned implicitly in their decisions. Specifically, in debating the issue of whether continued mining should be permitted, legislatures should weigh these implicit values against the estimates presented above.

VIII

MODEL STATE MINING AND ENVIRONMENTAL QUALITY ACT

Introduction

The model statute which follows is designed to give to state government the powers necessary to deal with adverse environmental effects from mining operations. Several observations on the scope of the statute should be noted at the outset. First, while this study has dealt only with the environmental effects of coal mining, the statute is designed to deal with the environmental effects from virtually all mining operations. There are reasons for so broadening the scope. Side effects from mining operations are more alike than different, and in keeping with current efforts to achieve greater integration within the state administrative structure it seems generally useful to group regulations under a single umbrella. But the statutory structure created is flexible so that the state Bureau of Mines created by the statute can through its rule-making powers distinguish between various mining operations where appropriate. This broader scope also dovetails with the format of the Administration's "Mined Area Protection Act" (H.R. 4967 and H.R. 5689) which is now pending in Congress.

Second, the statute is jurisdictionally generic--designed to be equally appropriate for Maryland, Ohio, Pennsylvania and West Virginia. Such a non-parochial format necessarily imposes a limitation on the statute's utility. It fails to adequately account for differences that may exist from state to state. Hence the hard work of integrating new administrative powers into the existing administrative apparatus (which this statute leaves undone) may materially vary from state to state. Likewise, differences in the topography and in the nature of the mineral resources of the several states may dictate different responses. For example, Maryland has significant holdings of sand and gravel in its tidelands which might more effectively be regulated by the state's coastal zone agency than by its Bureau of Mines. Finally, the states have differing constitutions which variously limit state action, particularly with reference to expropriation and financing powers. The commentary to the statute earmarks these particular problems. Notwithstanding this limitation it is hoped that the model legislation will prove adaptable, in whole or part, to the needs of all four states.

In preparation of the statute, extensive use was made of a draft of an unpublished document prepared for the Department of the Interior: Guidelines for State Environmental Regulations of Mining Operations consistent with "The Mined Area Protection Act of 1971" (Sept. 15, 1971).

MODEL STATE MINING AND ENVIRONMENTAL QUALITY ACT

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ARTICLE 1

BUREAU OF MINES

Part One

Purpose and Definitions

1.101 - Purpose.

It is the purpose of this Act to encourage the economic development of the mineral resources of the state in a manner which will preserve and enhance the quality of the environment.

1.102 - Definitions.

For the purpose of this Act:

(a) "Bureau" means the Bureau of Mines created by this Act.

(b) "Director" means the Director of the Bureau of Mines.

(c) "person" means an individual, partnership, corporation, joint stock company, firm, society, association or other unincorporated organization, receiver or trustee, and any officer, agent or employee of any of the foregoing acting in his capacity as such, but does not include governmental agencies or their officers and employees.

(d) "governmental agencies" means the government of the United States, this state and all other states, their political subdivisions, and every department, agency, commission and other unit or instrumentality thereof and interstate compact commissions.

(e) "mining operations" means (i) activities conducted on the surface or underground for the exploration for or extraction of minerals from their natural occurrences, and (ii) the cleaning, concentrating, refining, or other processing or preparation (excluding smeltering) and loading of crude minerals at or near the mine site, and the disposal of refuse from such processing or preparation. It does not include the extraction of minerals in a liquid or gaseous state by means of wells or pipes unless the process includes _in situ_ distillation or retorting.

(f) "underground mining operations" means mining operations carried out beneath the surface by means of shafts, tunnels, or other underground mine openings and such use of the adjacent surface as is incidental thereto; as well as activities related thereto.

(g) "surface mining operations" means mining operations carried out on the surface, including strip mining, open pit mining, auger mining, dredging, quarrying, and leaching, and activities related thereto.

(h) "mined area" or "area to be mined" means the surface and subsurface of an area in which mining operations are being, have been or will be conducted including private ways and roads appurtenant to any such area, land excavations, workings, refuse banks, tailings, spoil banks, and areas in which structures, facilities, equipment, machines, tools or other materials or property which result from, or are used in, mining operations are situated.

(i) "operator of a mining operation" means any person or governmental agency controlling or managing a mining operation.

(j) "reclamation" means activity which is taken during or following a mining operation to avoid or correct adverse environmental effects of mining operations.

(k) "reclamation facilities and projects" means any real or personal property, the improvements thereof or thereon, and any and all rights of way, water, water rights, plants, structures, machinery and equipment, acquired, constructed, operated or maintained, and any work, service or activity to avoid or correct adverse environmental effects from mining operations. Reclamation facilities and projects include, but are not limited to, the following: (i) mine drainage treatment facilities; (ii) extinguishment of mine, outcrop and refuse bank fires; (iii) backfilling, regrading and revegetation of waste areas left from mining operations; (iv) covering of surface waste areas left from mining operations; (v) creation of parks, recreation, and scenic areas in mined areas; (vi) activities designed to beautify or screen mined areas; (vii) construction and maintenance of seals or casing on boreholes, wells, shafts, tunnels or entries that result from deep mining operations; (viii) filling, backfilling, and flushing areas of subsidence and; (ix) any other activities designed to avoid or correct adverse environmental effects of mining operations.

(l) "mineral rights" means any legally recognized interest in mineral resources, including but not limited to leasehold rights, mineral estates, profits, easements, and any property rights or contract rights which permit a person holding such rights to engage in a mining operation.

(m) "holder of an interest in mineral rights" means any person or governmental agency having an interest in mineral rights. Persons or governmental agencies within the purview of this definition shall include but not be limited to fee simple owners of mineral rights, or any other persons or governmental agencies receiving royalties or periodic payments in return for permitting mining operations.

(n) "Advisory Committee" means the Advisory Committee on Environmental Problems created by this Act.

Part Two

Organization

1.201 - Creation.

There is hereby created a Bureau of Mines which shall be within the Department of Natural Resources.

2.202 - Director.

(a) The Governor shall appoint, upon the recommendation of the Secretary of Natural Resources, a competent person with the qualifications prescribed herein as Director of the Bureau of Mines. The Director shall be the head of the Bureau and shall personally direct its operations and activities. The Director shall be a person with executive ability and exeperience, and shall have an academic degree and knowledge of the general principles involved in the administration, improvement, planning, management and conservation of mineral resources. The Director shall devote his full time to the work of the Department and shall receive such salary as may be provided by law. The Director may be removed by the Governor, upon recommendation of the Secretary of Natural Resources, for failure to comply with written directives of the Secretary, or for willful or repeated disregard of policies enunciated by the Secretary.

(b) The Director shall be responsible for the exercise of all the powers and duties conferred upon the Bureau by this Act.

1.203 - Staff.

The Director shall appoint the staff of the Bureau, subject to the provisions of the merit system. The staff of the Bureau shall consist of such employees as may be necessary to carry out the duties of the Bureau, in such numbers and at such salaries as provided by law. All employees shall be under the supervision and control of the Director and shall perform such duties as he may prescribe.

1.204 - Advisory Committee on Environmental Problems.

(a) There is hereby created an Advisory Committee on Environmental Problems of eleven members. Ex officio members shall be the directors of the following state agencies or their designated representatives: the Geological Survey agency; the Fish and Wildlife agency; the Parks and Recreation agency; the Water Quality agency, and the Air Quality agency. The Governor shall appoint for three year terms, additional members from the following categories: two members representing organizations engaged in conservation activities; two members representing the mining industry, and two members who serve as soil conservation district supervisors in counties with mining opertions.

(b) The Advisory Committee shall select its chairman and shall meet at least once every six months. Special meetings may be called by the chairman. A majority of members shall constitute a quorum. The members shall serve without compensation, other than reimbursement for travel and actual expenses incurred in performance of their duties.

(c) The Advisory Committee, when so requested by the Director, shall advise and assist in the formulation and review of Bureau rules and regulations and orders and in the resolution of problems and disputes which may arise.

Part Three

General Powers and Intergovernmental Relationships

1.301 - General Powers.

In addition to the powers specifically delegated to the Bureau by this Act, it shall also have the power to:

(a) supervise, regulate and control mining operations;

(b) exercise the powers conferred and perform the duties imposed by all laws hereafter enacted relating to mining operations;

(c) enter into contracts, and sue and be sued in its own name;

(d) collect, compile, analyze, interpret, coordinate, tabulate, summarize, and distribute technical and other data and conduct studies, sponsor research and prepare reports on mineral resource problems of the state;

(e) prepare, publish and disseminate information and reports in relation to mining operations and provide technical assistance to those engaged in mining operations;

(f) plan, design, acquire, construct, reconstruct, complete, own, improve, extend, develop, operate, maintain, and regulate any projects, facilities, properties, activities, and services, determined by the Bureau to be necessary, convenient or useful for the purposes of this Act;

(g) negotiate for and accept loans, grants, services, or other aids from governmental agencies or private sources to finance or assist in effectuating any of the purposes of this Act;

(i) institute actions in its own name to compel compliance with any of the provisions of this Act or any of the rules and regulations of the Bureau adopted pursuant thereto;

(j) acquire real or personal property and any interest therein as it may deem appropriate for carrying out its functions under this Act;

(l) sell or dispose of any of its products or services and make charges in connection with the use of any of its facilities;

(m) conduct such investigations and inspections as it may deem appropriate to carry out its functions under this Act;

(n) undertake or contract for with any private or governmental organization, laboratory or research group, studies, surveys and experiments concerning the resources of the State.

1.302 - Intergovernmental Relationships.

(a) When the Bureau deals with mining operations located in a common natural region consisting of two or more states it shall coordinate its regulations, activities and programs with those of the other state or of any interstate agency. The Bureau may negotiate with agencies of the other state or with any interstate agency and develop and promulgate uniform regulations.

(b) When the Bureau finds that there would be advantages in the development of cooperative programs with the agencies of another state it shall negotiate the scope of such a program and a proposed funding arrangement. Such programs shall only take effect if approved by the legislature.

(c) When the Bureau finds that there would be advantages in enactment of an interstate compact to manage and regulate mining operations located in a common natural region, it shall develop and recommend to the legislature adoption of such a compact.

Comments to ARTICLE 1.

Article 1 defines the terms used throughout the statute, creates the Bureau of Mines, outlines its internal structure, and invests it with a boilerplate of general powers. The Bureau is placed within the state's major natural resource department (e.g., Department of Natural Resources, Department of Environmental Affairs, etc.) and headed by a single executive director who acts under the authority of the executive head of the major department. This structure is designed to prevent administrative fragmentation to meet the admonition of the First Hoover Commission that "the exercise of authority is impossible without a clear line of command from the top to the bottom and a return line of responsibility and accountability from the bottom to the top."

Because of the apparent success of the Land Reclamation Committee (composed of ex-officio representation of the state's geological survey, water quality, parks, fishery, and soil conservation agencies, and representatives of the mining industry) which helps administer the Maryland surface mining laws, consideration was given to creating a similar committee within the Bureau of Mines. This was rejected because it is felt that the workload will be too great for such a part-time body. However, Section 1.204 creates an advisory committee which will expose the Bureau to a diversity of viewpoint and expertise.

Much of the present emphasis on environmental problems points to the difficulties occasioned in state regulation of broad regional problems. Interstate compacts are often suggested as a solution. This statute, however, proceeds on the assumption that the requisite first steps are an active response at the state level. Then to the extent the states find themselves hampered, they will be in a position to develop appropriate cooperative programs, new interstate institutions. Section 1.302 of the statute directs the Bureau to coordinate its activities with the agencies of other states and with existing interstate agencies (e.g., ORSANCO and the Susquehanna River Basin Commission). Section 1.302 also charges the Bureau to propose creation of new interstate agencies when it finds they would be dangerous.

ARTICLE 2

REGULATION OF THE ENVIRONMENTAL EFFECTS OF MINING OPERATIONS

Part One

Regulatory Power

2.101 - Scope of Regulatory Power.

The Bureau shall adopt and from time to time review, revise and amend regulations necessary or useful to avoid or correct adverse environmental effects of mining operations.

Part Two

Environmental Quality Standards

2.201 - Air Quality.

Following consultation with and obtaining comment from the state's air quality agency, the Bureau, after notice and hearing, by regulation shall establish standards limiting the levels of airborne dust, smoke or emissions from mined areas, or mine fires, or from blasting, hauling, dumping, or ventilating procedures conducted pursuant to mining operations. Such standards shall be at least as stringent as the state's air quality standards.

2.202 - Water Quality.

Following consultation with and obtaining comment from the state's water quality agency, the Bureau, after notice and hearing, by regulation shall establish standards limiting surface and ground water discharges which are contaminated with acid, debris, silt, dissolved or suspended solids or other wastes from mining operations. Such standards shall be at least as stringent as the state's water quality standards and may be in the form of effluent standards or receiving water standards.

2.203 - Noise.

Following consultation with and receiving comment from state agencies which have special expertise with respect to noise and seismic disturbance, the Bureau, after notice and hearing, by regulation shall establish standards limiting noise and seismic disturbances from drilling, blasting, hauling and other incidents to mining operations.

2.204 - Subisdence and Land Slides.

Following consultation with and receiving comments from state agencies which have special expertise with reference to geological problems, soil conservation and forestry,the Bureau, after notice and hearing, by regulation shall establish standards as to mined areas so as to maintain overlying ground stability and to ensure against slope failures of highwalls and spoil banks.

2.205 - Protection and Restoration of Surface.

Following consultation with and receiving comment from state agencies which have special expertise with respect to geological problems, soil conservation and forestry, the Bureau, after notice and hearing, by regulation shall establish standards specifying regrading and revegetation required to be effected during and following mining operations. Such regulations may relate, but are not limited, to the following: burying of toxic material; re-establishment of original contour; fertilization; replantings; sealing of surface fissures and underground mine openings, filling in areas of subsidence and screening mining operations for aesthetic purposes.

Part Three

Prohibition of Mining Operations

2.301 - Prohibition.

The Bureau, after notice and hearing, may by regulation prohibit mining operations in certain geographical regions; or under certain geological or topographical conditions, or using certain mining techniques, upon a finding that under the state of technoology existing at that time such mining operations would result in (i) violation of this Act or the regulations promulgated thereunder; (ii) violation of any other applicable law or regulation; (iii) irreparable harm to the environment; or (iv) significant hazard to public health and safety.

2.302 - Appeal.

Any person having an interest in the mineral rights with respect to which the Bureau has prohibited mining operations may petition the district court for the county in which the mineral rights are located to determine whether the prohibition so restricts the use of his property as to constitute an unconstitutional taking without compensation. If the court finds the prohibition to constitute an unconstitutional taking it shall enter a ruling that the prohibition does not apply to the interest of the petitioner; provided, however, that such finding shall not effect any interest other than that of the petitioner.

Part Four

Responsibility for Violation of Regulations

2.401 - Mine Operators.

Mine operators shall be responsible for any violation of this Act or the regulations promulgated thereunder, which result from mining operations controlled or managed by them. Responsibility shall continue to attach, notwithstanding that the mining operation is inactive when a violation occurs, unless a Certificate of Reclamation for the mining operation has been obtained pursuant to Section 3.214 of this Act.

2.402 - Holders of Interests in Mineral Rights.

Holders of interests in mineral rights shall be responsible for any violations of this Act, or the regulations promulgated thereunder, which result from mining operations in the exercise of their mineral rights, regardless of whether such holders have contracted out the right to engage in mining operations to independent mine operators. Responsibility shall continue to attach notwithstanding that the mining operation is inactive when the violation occurs, unless a Certificate of Reclamation for the mining operation has been obtained pursuant to Section 3.214 of this Act.

Comments to ARTICLE 2.

> Generally speaking there are two sorts of environmental quality standards. "Background standards" limit the maximum permissible level of bad environmemtal effects in the general surroundings. They are illustrated by ambient air quality standards and receiving water quality standards. "Site standards" limit the maximum permissible level of bad environmental

effects that may be discharged at a given place or from a given activity. They are illustrated by effluent standards limiting what can be spewed from a pipe or stack.

In a loose sense, Article 2 gives to the Bureau rule-making authority to establish "background standards" to be applied in mined areas; Article 3 gives to the Bureau licensing power to establish "site standards" for particular mining operations. There are a variety of advantages in complementing the Bureau's specific licensing power with general rule-making power. The licensing powers provided by Article 3 are prospective in application -- applying only to mining operations on-going after the statute's effective date. As noted throughout the report past mining operations have created pervasive environmental problems and the accountability of persons other than the actual mine operator is often in doubt.

Article 2 responds to this problem by providing for the establishment of a variety of standards (air quality, water quality, noise, subsidence and land slides, and restoration of surface) and by specifying in Sections 2.401 and 2.402 those persons accountable for violations. Section 2.401 specifies the continuing responsibility of the original mine operator (regardless of whether he is still operating the mine) unless he has procured a release from the Bureau pursuant to Section 3.214 of the Act. Section 2.402 clarifies the legal responsibility of those persons who have a participatory interest in the mining operation for violations of the Act's environmental standards. The impact of that responsibility is specified in Article 6 of the Act.

Consideration was given to extending responsibility to owners of severed surface rights. This was rejected because of the constitutional problems involved, and because it might on occasion trap and surprise the unwary seller of mineral rights. Moreover, the Bureau is guaranteed surface access to mine sites elsewhere in the statute, and the combined responsibility of the mine operator and the holder of mineral rights ordinarily provide an adequate surety base to guarantee reclamation.

However, even with these provisions more clearly defining legal responsibility for environmental side effects from coal mines, with reference to many inactive mines there often will be no person who is financially accountable. It is then incumbent on the Bureau itself to undertake the reclamation effort under Article 4 of the statute.

The general regulations which will be promulgated under Article 2 also serve as a prophylaxis against legal challenges to the Bureau's decisions on the ground that they are arbitrary and capricious. For example, under Section 2.301 the Bureau is given rule-making power to prohibit mine operations which under the present state of technology are not subject to effective reclamation or which present a public health and safety hazard. Under this power the Bureau might prohibit surface mines on a steep grade because of revegetation problems, or prohibit underground mining in populated areas because of safety problems. It is true the Bureau could accomplish the same goal under Article 3 by denying permits on an ad hoc basis. But it seems much preferable to proceed with regulations promulgated pursuant to statutory standards, thereby minimizing the effectiveness of the argument that the law is being unevenly applied.

The prohibition of particular types of mining operations will raise constitutional questions as to whether such action constitutes a taking of private property for which the state must pay compensation. As developed in the

Report, the courts have failed to develop a clear litmus test as to what constitutes such a taking. Section 2.302 responds to this uncertainty by permitting an owner of mineral rights, who feels that his rights have been expropriated, to petition for judicial redress. It has two advantages. First, it provides a clear procedure for vindicating a constitutional right; second, it reduces the pressure on courts to strike down the whole of a regulatory prohibition as unconstitutional, by providing an escape valve.

ARTICLE 3

APPROVAL OF MINING OPERATIONS

Part One

Prior Approval

3.101 - Prior Approval Required.

No person or governmental agency shall engage in any mining operation without prior approval of the Bureau under the provisions of this Article.

Part Two

Permits for Mining Operations

3.201 - Delineation of Mining Operations.

The Bureau by regulation shall prescribe standards by which mining operations can be delineated into separate activities or areas for purposes of evaluation or issuance of permits.

3.202 - Requirement of Permit.

No person or governmental agency shall commence or continue a mining operation after the effective date of this Act without a permit from the Bureau.

3.203 - Application for Permit.

An application for a permit for mining operations shall be in writing in such form and containing such information as the Bureau shall prescribe by regulation and shall include but not be limited to background information, an operating plan, and a reclamation plan. It shall be accompanied by such standard application fee as the Bureau determines is sufficient to defray the costs of the procedures established to consider applications, and which shall not be returnable.

3.204 - Background Information.

(a) The identifying information shall consist of: (1) the names and addresses of holders of interests in land or mineral rights in or contiguous to the area to be mined; (ii) holders of interests in mineral rights to be mined; (iii) any purchasers of such interests in land or mineral rights under real estate contract; (iv) the mining operator. If any of the above be business activities other than sole proprietor, the names and addresses of their principal officers and resident agents shall be included.

(b) The following information about the mined area shall also be provided: the surface topography, make-up of the geological strata, concentration of soluble toxic metal ions and radioactive materials, surface and ground water systems, and such other information as the Bureau may require.

3.205 - Operating Plan.

The Operating Plan shall include the following:

(a) Types of mining operations that exist or are proposed;

(b) Anticipated or actual starting and termination dates of the mining operation;

(c) Location and extent of area to be mined, including annotated maps or aerial photographs depicting: boundaries of the interest in land and mineral rights to be affected; location of these interests within the governmental units and their relationship to newly developed areas; land-use prior to mining operation; and, location and names of existing waterways, drainages, roads, trails, railroad, buildings, utility rights of way and historic or aesthetic features within and contiguous to the area to be mined; and

(d) A schedule indicating the projected phases of the mining operation.

3.206 - Reclamation Plan.

The Reclamation Plan shall include the following:

(a) A description of the planned use of the area to be mined after the mining operation is completed and the nature and extent of reclamation necessary to facilitate this use;

(b) An estimate of the time needed to complete all planned reclamation;

(c) A schedule indicating the projected phases of the reclamation process correlated with the schedule of mining operations provided for in Section 3.205(d).

(d) A description of the steps to be taken to ensure that the mining operation complies with the environmental quality standard promulgated under Article 2 of this Act and with all other applicable laws and regulations dealing with environmental quality, health and safety. Where applicable, the Reclamation Plan shall also contain the following: (i) Provisions to prevent degradation of ground and surface water streams by directing surface water streams from unreclaimed mine areas or active mine areas, treating drainage from mining wastes or spoil accumulations, and sealing or casing of tunnels, boreholes, wells, and shafts that cross aquifers; (ii) Provisions to protect against flooding resulting from: silting or damming up of stream channels, inadequate drainage systems for strip pits, contour benches and settling ponds and uncontrolled erosion; (iii) Provisions to prevent debris slides and slope failures on highwalls and spoil banks; (iv) Provisions to control dust, smoke and other emissions; (v) Provisions to minimize noise and seismic disturbances from drilling, blasting and hauling; (vi) Provisions to prevent fires in mines, outcrops and waste banks, and to prevent the spread of such fires; (vii) Provisions to ensure that underground mining is conducted so as to protect overlying ground stability; (viii) Provisions to regrade and revegetate mineral areas so as to minimize erosion and contamination of surface or ground water; (ix) Provisions to screen the view of mining operations from surrounding areas; (x) Provisions to ensure that no adverse environmental side effects or waste accumulation will be located outside of the designated permit area.

3.207 -- Charge for Use of Bureau's Reclamation Facility or Project.

Where the Reclamation Plan involves use of a reclamation facility or project undertaken by, or to be undertaken by the Bureau, the Bureau shall calculate a charge to be imposed on the applicant taking into account the full cost of each facility or project and the pro-rata share of such cost which may be equitably attached to the proposed mining operation to be conducted by the applicant. In determining such pro-rata share the Bureau shall take into account costs which will accrue both during and after the active mining operation. The Bureau may impose either a single charge,or periodic charges for the anticipated duration of the mining operation, and such charges shall be subject to modification by the Bureau, from time to time, prior to issuance of a Certificate of Reclamation pursuant to Section 3.214 of this Act.

3.208 - Consideration of Application.

(a) Upon receipt of a complete application and the application fee, the Bureau shall give notice and hold a seasonable hearing.

(b) The Bureau shall issue a permit if: (i) it finds on the basis of the application, including the Operating and Reclamation Plans, and the evidence adduced at the hearing, that the mining operation will be in compliance with this Act, the regulations promulgated under this Act and all other applicable laws and regulations dealing with environmental quality, health and safety; (ii) the applicant has paid the application fee specified in Section 3.203 of this Act; and (iii) the applicant has tendered the charge, if any, imposed under Section 3.207 of this Act and determined by the Bureau to be payable at that time.

(c) The Bureau shall deny a permit if it finds that (i) any of the conditions in paragraph (b) of this Section have not been fulfilled; or (ii) the applicant has forfeited any bond or security deposit posted with respect to mining operations in any state of the United States of America or, if the applicant is a corporation, partnership or association, that any officer, director or principal owner of such corporation, partnership or association, has previously forfeited any bond or security deposit posted with respect to a mining operation in any state of the United States of America.

(d) The Bureau may require more information from an applicant if it finds it to be necessary to determine whether the permit should be issued.

(e) If the Bureau denies a permit it shall notify the applicant of the reasons, listing whatever changes to the Operating and Reclamation plans are necessary.

3.209 - Payment of Charge to General Reclamation Fund.

Charges paid to the Bureau pursuant to Section 3.207 of this Act shall be deposited in the General Reclamation Fund.

3.210 - Rights Created by Permit.

(a) Permits issued under this Article shall be in writing and shall state the date, conditions and qualifications of their issuance, and duration and geographical area of their validity.

(b) Permits issued under this Act shall not create any vested rights in the holders and may be limited or rendered nugatory by exercise of the Bureau's powers under Section 2.301 of this Act, by other changes in laws or regulations, or by suspension, revocation or modification according to the procedures hereinafter provided.

(c) The holder of a permit may seek modification of the permit's terms by following the same procedures provided for the original issuance of a permit. The Bureau may, on its own initiative, after notice and hearing modify the terms of a permit.

3.211 - Suspension and Revocation of Permits.

(a) The Bureau shall suspend a permit and issue an order directing stoppage of the mining operation whenever it has reasonable grounds to believe that the mining operation is no longer being conducted in compliance with the requirements of Section 3.208(b) and (c) or that a mining operation has violated the terms of the permit, the provisions of this Act, the regulations promulgated thereunder or any other applicable law or regulation. Suspension may be for a definite or an indefinite period of time. Reinstatement shall be conditioned on a halt to the violation, correction of any adverse environmental side effects which have resulted from it, and such other conditions as the Bureau finds appropriate. If there are reasonable grounds to believe that any of these conditions are unlikely to be fulfilled,the Bureau shall revoke the permit and may revoke any other permits held by the mine operator.

(b) Before suspending a permit, the Bureau shall hold a seasonable hearing. A copy of the charges, together with a notice of the time and place of hearing, shall be personally served or mailed by registered mail to the last known address of the mine operator. At any hearing, the accused mine operator shall have the right to appear in person and by counsel to cross-examine witnesses and to produce evidence and witnesses in his own defense.

(c) Whenever the Bureau has reasonable grounds to believe that a mining operation is in continuous violation of the terms of the permit, the provisions of this Act, the regulations issued thereunder or any other applicable law or regulation,the Bureau may suspend a permit and issue an order directing stoppage of work without a hearing. Whenever a permit is suspended without a hearing, a hearing shall be scheduled under paragraph (b) of this Section at the earliest reasonable time.

3.212 - Inspection and Monitoring.

The Bureau may at reasonable time enter upon and inspect sites of mining operations and may install monitoring devices on such sites. The purpose of such inspection and monitoring activity shall be to: (i) evaluate the amount of performance bond or deposit; (ii) determine whether the mining operation is complying with the terms of the permit, the provision of this Act and regulations promulgated thereunder, and all other applicable laws and regulations; and (iii) determine the effectiveness of the environmental quality standards that are being imposed on the mining operation.

3.213 - Performance Bond or Deposit.

(a) Following issuance of a permit but before commencing mining operations, a mine operator shall deposit with the Bureau a performance bond, cash, or negotiable bonds of the United States government, in an amount sufficient as determined by the Bureau, to defray the costs of reclamation required by the terms of the permit, the provisions of this Act and regulations promulgated thereunder, and other applicable laws and regulations, and to ensure payment of any unpaid charges imposed by the Bureau pursuant to Section 3.207 of this Act.

(b) Performance bonds shall be in a form to be prescribed and furnished by the Bureau, and payable to the state.

(c) Deposits of cash or securities shall be deposited by the Bureau with the State Treasurer, who shall hold the bond in the name of the state, in trust, for the purposes for which the deposit is made. The operator making the deposit, from time to time may demand and receive from the State Treasurer, the whole or any portion of any securities so deposited, upon depositing with the State Treasurer, in lieu thereof, other negotiable securities of the classes herein specified having a market value at least equal to the sum of the bond.

(d) If the Bureau finds under the procedures set forth in Section 3.211 of this Act that a mine operator has failed to comply with the reclamation requirements of the permit, the provisions of this Act, or the regulations promulgated thereunder or any other applicable law or regulation, the Bureau shall declare the bond forfeited and shall proceed to sue out and collect the amount of liability thereon, or if the mining operator has deposited cash or securities in lieu of bond the Bureau shall declare that portion of the deposit forfeited, and it shall direct the State Treasurer to pay the funds into the General Reclamation Fund.

(e) If the performance bond or deposit proves insufficient to defray the full cost occasioned by the mine operator's failure to comply with reclamation requirements of the permit, the provisions of this Act or the regulations promulgated thereunder, or any other applicable law or regulation, or any unpaid charge imposed by the Bureau pursuant to Section 3.207 of this Act, the mine operator shall be civilly liable to the Bureau for the additional amount necessary to defray such full costs. Amounts so recovered by the Bureau shall be paid into the General Reclamation Fund.

(f) Liability under a bond or deposit shall continue until the mine operator receives a Certificate of Reclamation under the provisions of Section 3.214 of this Act.

3.214 - Certificate of Reclamation.

Upon completion of a mining operation including the required reclamation work, a mining operator may make application in such form as the Bureau may require, for a Certificate of Reclamation. If the Bureau finds that the mine operator has complied with the reclamation requirements of the permit, the provisions of this Act, the regulations promulgated thereunder, and any other applicable laws or regulations, it shall issue the mine operator a written Certificate of Reclamation. Upon issuance of such a Certificate, the mine operator shall be excused from responsibility for any subsequent environmental damage arising from previous mining operations at the permit site.

3.215 - Annual Reports.

Holders of permits shall submit annual reports to the Bureau at such time, in such form and with such information as the Bureau may require.

3.216 - Notice to Bureau.

Mine operators shall give the Bureau immediate notice, in such manner as the Bureau may provide by regulation, in any of the following cases:

(a) When any changes occur in the officers, directors or principal owners if the mine operator is a corporation, partnership or association;

(b) When the mining operation is discontinued permanently or temporarily;

(c) When there is a violation of any of the terms of the permit, or of this Act or the regulations promulgated thereunder, or of any other applicable laws or regulations.

3.217 - Mine Maps.

Every mine operator shall make or cause to be made a true and accurate map or plan of the workings or excavations of such mine which shall be in accordance with standards established by the Bureau. Such maps or plans shall show in detail, and in markings of a distinctive color, all contemplated workings which are intended to be undertaken or developed within the succeeding year. Such maps or plans shall accompany the annual report and shall also be deposited with the receiver of deeds of any county in which such mining is or will be conducted, and in addition thereto, with such political subdivisions where mining is taking place or is contemplated, as shall request such maps. Such maps or plans shall be considered public records and shall be open to the inspection of the public and copies or tracings may be made therefrom. The Bureau may require the making and filing of maps more often than annually.

Part Three

Severance Tax

3.301 - Underground Mining Operations.

A severance tax of $_____ per ton is hereby levied upon the taking of minerals by underground mining operations.

3.202 - Surface Mining Operations.

A severance tax of $_____ per ton is hereby levied upon the taking of minerals by surface mining operations.

3.303 - Payment.

The tax shall be paid by the mine operator at such times and in such manner as the Bureau may prescribe by regulation. Failure to pay the tax when due shall be deemed a violation giving rise to suspension or revocation of permit under Section 3.211 of this Act. An unpaid tax, upon being recorded in the title records for the county where the mining operation takes place, shall become a lien against all mineral rights and property interests which are used in conjunction with the mining operation and held by persons responsible for violations of the Act and shall be referred to the Attorney General for collection.

3.304 - Deposit in General Reclamation Fund.

The Bureau shall deposit all severance tax proceeds received by it into the General Reclamation Fund created by Section 5.301.

Comments to ARTICLE 3.

The advantages of complementing the general quality standards discussed in the commentary to Article 2 with a requirement that specific job approval be obtained, are manifest. A permit system helps the Bureau prevent environmental degradations rather than merely responding to degradations which already exist; a permit system shifts the burden of establishing that a mining operation will not have adverse environmental effects to the applicants and provides a vehicle through which the Bureau can fix responsibility for degradations which do occur. Section 3.101 lays the ground work by making it unlawful to engage in mining operations without a permit.

Sections 3.201 - 3.206 specify the details of the permit system. Generally they require that the applicant produce background data about the site he intends to mine and plans for proposed mining operations and reclamation activities.

Section 3.207 provides a mechanism through which private mining operations may be hooked into public reclamation facilities. For example, if the applicant wishes to engage in underground mining activities in a watershed where the Bureau has, or plans to construct a permanent mine acid treatment facility, his reclamation plan might provide for piping the mine acid drainage resulting from his operation to such plant for treatment. Section 3.207 provides under this circumstance that the Bureau shall calculate a pro-rata charge to be levied against applicants for such use. Either a lump sum or installment payments are permitted, but all payments are to be received prior to the release of the operator from future obligation pursuant to the procedures in Section 3.214. The Bureau may also modify the charge prior to issuance of the release. Section 3.209 provides for payment of the charge into the General Reclamation Fund created by Section 5.301 of the Act.

Section 3.208 sets forth the procedures and criteria for consideration of permit applications. The procedures specified require notice and hearing. The criteria require a finding of compatability with the environmental quality standards established under Article 2 of this Act, and with other applicable laws and regulations (e.g., sediment control laws, general water quality standards, etc.), and that the applicant has not previously forfeited a bond or security deposit because of failure to comply with mining laws or regulations. If the Bureau denies a permit it is required to specify reasons.

Section 3.210 makes clear that the rights created by a permit are subject to review and modification by the Bureau. This power might be used to require alterations in the nature of the mining operations or reclamation operations when environmental quality standards are made more stringent.

Section 3.211 provides for quasi-judicial procedures through which permit rights may be suspended or revoked because of violations of the permit's terms or of other mining laws or regulations. The mine operator is guaranteed the right to produce evidence and to cross examine witnesses. Upon a finding that a violation occurred the Bureau may revoke the permit or suspend it for a fixed period of time.

Section 3.213 provides that each mine operator shall post a performance bond (or an alternative security deposit) with the Bureau before commencing mining operations. The bond is to be set by the Bureau in an amount sufficient to defray the costs of completing reclamation should the operator default. Upon a finding by the Bureau that the operator has completed the reclamation work in a satisfactory fashion, Section 3.214 provides a procedure through which the operator may be formally released from further obligation, and the bond or security deposit returned.

Section 3.217 permits the Bureau to enter the mine premises and correct a permit violation and to charge when the mine operator fails or refuses to do wo.

Sections 3.301 through 3.304 provide the outline of a severance tax on the taking of minerals. The amount of the tax per ton is left to legislative determination and it is likely that the legislature may wish to develop variable taxes depending on the type of mineral being taken and the method of taking. It is hoped that the legislature will select rates, the proceeds from which will cumulatively, when added to forfeited bonds and other damages collected for permit violations, create a fund sufficient to pay the annual capital and operating cost of controlling the mine side effects resulting from mine operations on-going after the Act's effective date. This would impose on each successive crop of coal miners the cost of the Act's administration and implementation, and the cost of failure of the licensing provisions of the Act to prevent all adverse environmental side effects. This is the function of the General Reclamation Fund, into which revenues from the tax are poured.

ARTICLE 4

PROJECTS AND FACILITIES

Part One

General Powers

4.101 -- Programs.

The Bureau shall from time to time adopt programs necessary and useful to implement the provisions of this Act and the regulations promulgated thereunder and to avoid or correct adverse environmental effects of mining operations.

4.102 - Assistance and Training Programs.

The Bureau shall provide administrative and technical assistance, and training programs for persons and governmental agencies engaging in mining operations and in enforcement of environmental regulations. It shall be the purpose of such programs to gather, evaluate and distribute information concerning the adverse environmental effects of mining operations.

4.103 - Research.

The Bureau shall formulate and fund research programs when it determines that there are inadequate techniques to adequately deal with adverse environmental effects of mining operations.

Part Two

Inventory

4.201 - Inventory of Mining Operations.

The Bureau shall with the assistance of other interested Federal state and local agencies, develop, and from time to time, review, revise and amend an inventory of mining operations in the state. The inventory shall generally comprise a report of statement with maps, diagrams and text, and shall include, but need not be limited to:

(a) a geological survey element showing the location and extent of the mineral resources of the state;

(b) a hydrological survey element showing the location of surface waters, underground waters, and aquifers, and their relation to the mineral resources of the state;

(c) a land use element showing the location, extent and intensity of uses of land in areas having significant deposits of minerals;

(d) a mine element showing the location of and the adverse environmental effects from mining operations and which classifies such mine operations as active or inactive on the effective date of this Act. The adverse environmental effects considered under this section shall include, but need not be limited to: (i) mine, outcrop and refuse bank fires; (ii) surface waste areas left ungraded or without sufficient revegetation; (iii) surface waste areas with concentrations of soluble toxic metal ions or chemical wastes, or of high radioactivity; (iv) bore holes, wells or shafts that cross aquifers; (v) surface subsidence; and (vi) other contributions to air and water pollution.

(e) a periodic status report on mining operations conducted pursuant to permits issued under this Act showing the following: (i) location and extent of the area to be effected; (ii) the present status of the permit under which they were undertaken;(iii) extent of operating and reclamation progress; (iv) effectiveness of steps taken to control environmental effects and (v) such other information as the Bureau deems appropriate.

Part Three

Acquisition, Construction, Operation and Management of Reclamation Facilities and Projects by the Bureau

4.301 - General Powers.

(a) The Bureau, alone or in cooperation with one or more persons or governmental agencies, may acquire, construct, operate, maintain and administer such reclamation facilities and projects as it deems appropriate to deal with the environmental effects of mining operations.

(b) In construction, operation, maintenance and administration of reclamation facilities and projects the Bureau may act through public or private contractors, lessees or concessionaires.

4.302 - Acquisition.

The Bureau may acquire any interests in land or mineral rights necessary or useful to fulfillment of the purposes of this Act by purchase, gift, grant, devise, bequest, lease, exercise of the power of eminent domain, exchange or otherwise.

4.303 - Declaration of Public Purpose.

(a) The legislature hereby declares that the acquisition of any interest in land or mineral rights in order to construct, operate or manage reclmation facilities and projects constitutes acquisition for a public use, notwithstanding that the Bureau plans to hold the interest in land or mineral rights so acquired as an open space, or to resell the land, following completion of the reclamation facility or projects. Any moneys received from the sale of land acquired hereunder shall be deposited in the General Reclamation Fund created by Section 5.301 of this Act.

(b) The legislature hereby declares that construction, operation or management of reclamation facilities and projects on interests in land or mineral rights held by persons, constitutes an action for a public purpose.

4.304 - Exercise of the Power of Eminent Domain.

(a) When the Bureau desires to acquire an interest in land or mineral rights, and cannot reach an agreement with the persons who hold such interest or right as to what constitutes just compensation, it shall file a condemnation suit and take such interest or right, following a tender of just compensation as awarded by a jury to such persons; provided, however, when the Bureau determines that time is of the essence, the Bureau may take such interest or rights immediately upon payment by the Bureau either to such person or into court of such amount as the Bureau shall estimate to be the fair value of such interest or rights, and provided further that the Bureau, shall also pay to such person any further amount as the Bureau shall estimate to be the fair value of such interest or rights, and provided further that the Bureau, shall also pay to such person any further amount that may subsequently be awarded by a jury, with interest from the date of the taking.

(b) When the Bureau desires to acquire an interest in land or mineral rights, and cannot determine what person or persons hold such interest or right, the Bureau shall file a condemnation suit, and give notice, and may take such interest or rights immediately upon payment into court of such amount as the Bureau shall estimate to be the fair value of such interest or right. If a person or persons establishes ownership of such interest or right within six years from the time of its taking, the court shall transfer the payment to them and the Bureau shall pay any further amount that may be awarded by a jury subsequent to the time of taking. If no person establishes ownership of the interest or right within six years from the time of such taking, the payment shall revert to the Bureau and be deposited in the General Reclamation Fund.

Comments to ARTICLE 4.

Article 4 deals with the Bureau's role as an action agency -- development of programs and research, preparation of an inventory of inactive and active mining operations, and acquisition, construction, operation and management of reclamation and abatement projects. Section 4.101 is an omnibus charge to the Bureau to develop programs. Section 4.102 directs the Bureau to provide technical assistance and training programs. In so doing the Bureau may take advantage of available non-financial assistance -- for example, from the Secretary of Interior, under Section 209(b) of the "Mined Areas Protection Act of 1971" (H.R. 4967 and H.R. 5689) if the bill is enacted into law. Section 4.103 provides for research programs.

Section 4.201 provides for preparation and maintenance of a continuing inventory of mining operations within the state. Of particular importance is the portion of the inventory which shows the location and adverse environmental effects of mining operations which are inactive on the effective date of the Act. This information will be used to determine the source of funding for the Bureau's reclamation projects and facilities. Under Article 5 of this Act the cost of projects and facilities remedying the adverse environmental effects resulting from mines which are inactive when the Act becomes effective are to be paid out of the Abandoned Mine Reclamation Fund (created by the sale of state bonds), while the cost of projects and facilities remedying the adverse environmental effects from mines licensed under this Act are to be paid out of the General Reclamation Fund (composed of damages and penalties recovered by the Bureau, the proceeds of forfeited performance bonds and security deposits, proceeds from the severance tax, monies appropriated by the legislature, and other miscellaneous sources). Hence a threshhold determination of the location and side effects resulting from inactive mines is important.

Sections 4.301 through 4.304 give to the Bureau the powers necessary to engage in public works projects designed to abate adverse environmental effects from mining operations. Such projects might include construction of mine drainage treatment facilities, regrading and revegetation of surface mines and construction of seals on mine openings.

A caveat should be appended to the eminent domain powers which these sections give to the Bureau. As noted in Chapter 6 of the study, the states have various constitutional provisions limiting exercises of condemnation powers. While in all four states it appears permissible to authorize the taking of private property for reclamation purposes, in Maryland (and perhaps in West Virginia) it is constitutionally impermissible to condemn land for reclamation purposes where it is intended to transfer the land back into the private sector, following reclamation. Likewise under the particular phraseology of Article 3 Section 40 of the Maryland Constitution which requires a jury determination and payment of just compensation before taking of property, the "quick-take" procedures of Section 4.305 are constitutionally inform. Hence certainly in Maryland, and perhaps in West Virginia, a state constitutional amendment would appear prerequisite to vesting the Bureau with the desired powers.

ARTICLE 5

BUDGETS AND FINANCING

Part One

Annual Budget

5.101 - Capital Budget.

The Bureau shall annually adopt a capital budget including all capital reclamation facilities and projects it proposes to undertake or continue, or towards payment of the cost of which it proposes to contribute, during the budget period, containing a statement of the estimated cost of each facility or project and the method of financing thereof. In financing capital reclamation facilities and projects the Bureau shall apply funds, according to the following order of priority: (i) any charges imposed on a mine operator for use of the facility or project under Section 3.207 of this Act; (ii) grants or other moneys which may be available from the Federal government; interstate compact commissions, or other governmental agencies, other than the Bureau; (iii) such funds as may be available from the Abandoned Mine Reclamation Fund created by Section 5.205 of this Act; (iv) such funds as may be available from the General Reclamation Fund created by Section 5.301 of this Act.

5.102 - Current Expense Budget.

The Bureau shall annually adopt a current expense budget for each fiscal year. Such budget shall include the Bureau's estimated expenses for administration, operation, maintenance and repairs, including a separate statement thereof for each program facility or project together with its cost allocations. The Bureau shall use the General Reclamation Fund created by this Act to finance such budget.

Part Two

Abandoned Mine Reclamation Fund

5.201 - Loan.

The Bureau is hereby authorized and directed to issue a state loan to be known as the Loan for Reclamation of Abandoned Mines in the aggregate sum of _______ million dollars to be used to finance the capital cost of reclamation projects and facilities designed to correct adverse environmental effects from mining operations which were inactive as of the effective date of this Act.

5.202 - Bonds.

(a) As evidence of the indebtedness authorized in Section 5.201 of this Act, bonds of the state shall be issued in accordance with Sections 5.202-5.204 of this Act, at any time or from time to time, to provide moneys necessary to carry out the stated purposes.

(b) Except as specified in this Act, the form, terms and conditions of issue, redemption and maturity, and time of payment of interest shall be as the issuing officials shall direct; provided, that no bonds of any series shall mature later than thirty years from the date of issuance. The issuing officials are hereby authorized to carry out the provisions of this Act relating to the issuance of bonds.

(c) All bonds issued under the authority of this Act shall bear the facsimile signatures of the issuing officials and a facsimile of the Great Seal of the state and shall be countersigned by two duly authorized officers of a duly authorized loan and transfer agent of the state.

(d) All bonds issued under the authority of this Act shall recite that they are issued for the purpose set forth in Section 5.201 of this Act and that they are issued in pursuance of this Act. In any action or proceeding involving the validity or enforceability of such bonds, such recital shall be conclusive as to their purpose and authorization.

(e) Anything in this Act to the contrary notwithstanding, the aggregate principal amount of notes and bonds, exclusive of funding bonds and refunding bonds, which may be issued pursuant to this Act shall not exceed _______ million dollars.

(f) All notes and bonds issued in accordance with this Act shall be direct obligations of the state and the faith and credit of the state are hereby pledged for the payment of the interest thereon as the same shall become due and the payment of the principal thereof at maturity. All notes and bonds issued under this Act shall be exempt from taxation for state and local purposes. The principal of and interest on such notes and bonds shall be payable in lawful money of the United States of America.

5.203 - Sale of Bonds.

(a) Whenever bonds are issued, they shall be offered for sale at not less than ninety-eight per cent of the principal amount thereof and accrued interest, and shall be sold by the issuing officials to the highest and best bidder or bidders after due public advertisement on such terms and conditions and upon such open competitive bidding as the issuing officials shall direct. The manner and times of advertising shall be prescribed by the issuing officials.

(b) Any portion of any bond issue so offered and not sold or subscribed for may be disposed of by private sale by the issuing officials in such manner and at such prices, not less than ninety-eight per cent of the principal amount thereof and accrued interest, as the Governor shall direct. No commission shall be allowed or paid for the sale of any bonds issued under the authority of this Act.

5.204 - Sinking Fund.

(a) All bonds issued under this Act shall be redeemed at maturity and all interest due from time to time on such bonds shall be paid from the Abandoned Mine Sinking Fund. The General Assembly, beginning with the fiscal year commencing _______, 19__, shall appropriate annually the moneys necessary to pay the aforesaid interest on said bonds and the principal of said bonds at maturity. All moneys so appropriated shall be paid into the Abandoned Mine Sinking Fund by the State Treasurer. All of such moneys not necessary to pay accruing interest shall be invested in such securities as are provided by law for the investment of the sinking funds of the state.

(b) The investment of such moneys and the accumulations thereon in the Abandoned Mine Sinking Fund shall be devoted to and be used exclusively for the payment of the interest accruing on such bonds and notes and for the redemption of such bonds at maturity. The issuing officials are authorized at any time to use any of such funds for the purchase and retirement of all or any part of the bonds issued under the authority of this Act. In the event that all or any part of said bonds shall be purchased by the state, they shall be cancelled and returned to the State Treasurer, as cancelled and paid bonds and thereafter all payments of interest thereon shall cease and the cancelled bonds and coupons shall be destroyed within two years after cancellation in the presence of the issuing officials.

5.205 - Abandoned Mine Reclamation Fund.

(a) An Abandoned Mine Reclamation Fund is hereby created.

(b) All proceeds from the sale of bonds under Sections 5.201 - 5.204 shall be paid into the Abandoned Mine Reclamation Fund.

(c) The moneys in the Abandoned Mine Reclamation Fund are hereby specifically dedicated to meeting the capital costs of reclamation facilities and projects designed to correct adverse environmental effects from mining operations which were inactive as of the effective date of this Act. If the Bureau undertakes to construct a reclamation facility or project which is designed to correct adverse environmental effects from several mining operations, some of which were inactive as of the effective date of this Act and some of which were then active, the Bureau shall develop a cost sharing formula which equitably allocates cost between such inactive and active operations.

Part Three

General Reclamation Fund

5.301 - Creation and Purpose.

There is hereby created a General Reclamation Fund. The moneys in the General Reclamation Fund are hereby specifically dedicated to the fulfillment of the mandates of this Act. By way of illustration, but not limitation, moneys may be used to meet the costs of the Bureau's expenses for: administration and operation, maintenance and repairs of reclamation facilities and projects, and the capital costs of reclamation facilities and projects not subject to reimbursement out of the Abandoned Mine Reclamation Fund created by Section 5.205 of this Act.

5.302 - Source of Proceeds.

The following moneys shall be paid into the General Reclamation Fund:

(a) all moneys received by the state as a result of the civil or criminal liability of mine operators under this Act, or under any other statute or common law which permits the state to receive damages or penalties because of adverse environmental effects from mining operations;

(b) all moneys payable as a result of forfeiture of performance bonds or security deposits under Section 3.213 of this Act;

(c) all charges collected under Section 3.209 of this Act;

(d) all proceeds from the severance tax levied under Section 3.301 of this Act;

(e) all proceeds from the sale of land under Section 4.303 of this Act;

(f) such moneys as the legislature may from time to time appropriate.

Comments to ARTICLE 5.

> Appreciation of the limitations of Article 5 is as important as an appreciation of its substance. The draftsmen of the statute harbor no illusion that they have mastered the intricacies of the budgetary and bonded indebtedness procedures of the several states. Bringing the statute into compliance with these norms is left to the Attorneys General of the states.
>
> But lurking beneath the technicalities of the Article are some basic value judgments. First, it is decided the cost of remedying adverse environmemtal side effects resulting from mining operations undertaken before this Act went into effect, should be paid from general revenues (except to the extent that there are persons liable for such costs under the prior law). This decision is implemented in Sections 5.201 through 5.205, by authorization for the floating bonds the proceeds of which are to be paid into the Abandoned Mine Reclamation Fund created by Section 5.205 which is earmarked for reclaiming inactive mines. The bonds are to be repaid from general revenues. This is essentially the procedure which has already been employed in Pennsylvania.
>
> It should be remembered, as discussed in Chapter 6 of the study, that there are constitutional problems with such a debt incurrence in all four states. Pennsylvania amended its constitution in order to bring about its extant program. It is also important to note that

special revenue bond financing is peculiarly unsuited for financing reclamation projects. Because of the transient nature of mining operations, user fees may prove inadequate to repay the indebtedness. Hence this method of avoidance of constitutional strictures general state indebtedness is not practicably available. Therefore state constitutional amendments may be necessary prior to implementing these provisions.

The second basic value judgment is that the cost occasioned by failure of this Act to preclude future environmental degradation ordinarily should be borne either by the mine operator who occasions the degradation or the mining industry generally. This decision is implemented by creation, under Section 5.301, of a General Reclamation Fund. Into this fund are paid damages and penalties recovered by the Bureau, the proceeds of forfeited performance bonds and security deposits, proceeds from the severance tax on miners, and supplementary contributions from the legislature. This fund is then earmarked for use in cleaning up post-Act problems and for the expenses of administering the Bureau.

Sections 5.101 and 5.102 outline the Bureau's budgetary procedures. They also account for the possibility that Federal funds may be available to help defray costs.

ARTICLE 6

GENERAL PROVISIONS

Part One

Administrative Procedures

6.101 - Rules and Regulations.

(a) The Bureau shall adopt and may amend and repeal rules of procedure for all activities it is authorized to undertake and for promulgation of regulations.

(b) The Bureau shall provide for the editing, publishing, compiling and indexing of all its rules and regulations.

(c) Any person or governmental agency may petition the Bureau requesting the promulgation, amendment or repeal of any rule or regulation. The Bureau shall prescribe by rule the form for such petitions and the procedure for their submission, consideration and disposition.

6.102 - Notice.

(a) Whenever notice is required it shall be given, in addition to any other method required by this Act, by publication once a week for two successive weeks in a newspaper having general circulation in the area or areas of the state to be affected by the proposed action of the Bureau. If the purpose is to give notice of a proposed public hearing, the notice shall identify the subject or subjects to be considered and specify the place and time, not less than ten days after final publication, or one day after final publication for a public hearing following suspension of a permit without a hearing. In addition to newspaper publication, notice of the proposed action of the Bureau, or of the public hearing, shall be posted in a conspicuous place at the offices of the Bureau. The Bureau may provide for other means of giving notice to the end that all persons and governmental agencies having an interest in the subject may reasonably be apprised thereof.

(b) The notice need not contain the entire text, plan, or detail of the proposed action of the Department or of the subject matter of the hearing, but shall reasonably identify the proposed action and state the place at which the entire text, plan, or detail, if any, may be examined or how it may be obtained.

6.103 - Hearings.

(a) Any hearing required by this Act shall be a public hearing. Any person or governmental agency claiming to have an interest in the subject matter of the proposed action by the Bureau shall be entitled to submit data or views at the public hearing.

(b) The Bureau in the conduct of hearings may admit and give probative force to evidence which possesses probative value commonly accepted by reasonably prudent men in the conduct of their affairs and may take notice of judicially cognizable facts and other general, technical,or scientific facts within its specialized knowledge.

(c) Bureau hearings may be conducted by the Director or by such person or persons as the Director may designate. The Director or any person authorized by the Director may administer oaths and affirmations, examine witnesses and receive evidence at a hearing. Any willful false swearing or affirming at a hearing as to any material fact shall be deemed perjury under the law of the state.

(d) Any final order, decision of action taken after hearing shall be in writing or stated in the record and shall be accompanied by findings of fact and conclusions of law.

6.104 - Subpoenas.

The Director or any persons authorized by the Director may issue subpoenas in the name of the Bureau to compel witnesses to appear and testify or to produce books, records, papers, documents or other tangible forms of evidence relating to any matter within the authority of the Bureau.

Part Two

Enforcement by the Bureau

6.201 - General.

The Bureau may bring any appropriate action, in the name of the state to carry out the provisions of this Act, the regulations promulgated thereunder, and to enforce all laws relating to the adverse environmental effects of mining operations.

6.202 - Issuance of Compliance Orders.

If the Bureau determines that there is or is likely to be a vaiolation of the terms of a permit, or of this Act, the regulations promulgated thereunder or any other law relating to the adverse environmental effects of mining operations, it may, after notice and hearing, order any persons or governmental agencies responsible to engage in reclamation operations necessary to avoid or correct the adverse environmental effects within a time and in a manner satisfactory to the Bureau.

6.203 - Reclamation by the Bureau.

If the recipient of a compliance order under Section 6.202 is unable or unwilling to comply, or if there is no responsible person to whom an order may be issued, the Bureau may engage in reclamation operations necessary to avoid or correct the adverse environmental effect.

6.204 - Right of Entry.

The Bureau shall have the right to enter at all reasonable times in or upon the mined area or any other private or public property for the purpose of inspecting and investigating conditions relating to the adverse environmental effects of mining operations, or to avoid or correct adverse environmental effects pursuant to Section 6.203.

6.205 - Injunctive Relief.

The Bureau may enforce or require compliance with any provision of this Act or any rule, regulation, decision or order by injunction.

6.206 - Civil Liability.

In addition to the penalties imposed by other provisions of this Act, all persons or governmental agencies responsible for a violation of the terms of a permit, or of this Act, or of the regulations promulgated thereunder, shall be jointly and severally liable to the Bureau for the damages occasioned. The measure of damages shall be the actual or estimated cost of avoiding or correcting the adverse environmental effects resulting from such violation, plus an estimate of the environmental loss to the state's resources caused by the violation.

6.207 - Penal Sanctions.

In addition to the civil liability imposed by other provisions of this Act, all persons responsible for violating the terms of a permit, any provisions of this Act or the regulations promulgated thereunder, other than those of a procedural nature or relating solely to the internal management of the Bureau, shall be guilty of a misdemeanor and, upon conviction, shall be punished by a fine not exceeding five hundred dollars ($500.00) for each offense. The penal sanctions herein provided shall not apply to any failure or refusal to pay charges or taxes levied by this Act. Each day during which a violation occurs shall be deemed a separate and additional violation. The employees of the Bureau assigned to law enforcement duties and all other law enforcement officers shall enforce the provisions of this Act and the regulations of the Bureau, and may make arrests for violation thereof.

Part Three

Relationship to Common Law and Severability

6.301 - Relationship to Common Law.

This Act and the regulations promulgated thereunder shall not be construed as in derogation of the common law, and common law liabilities for nuisance, trespass, violation of riparian rights, or other grounds, shall continue in force and effect.

6.302 - Severability.

If any provisions of this Act or the application thereof to any person or governmental agency is held invalid, such invalidity shall not affect the other provisions or any other application of the Act which can be given effect without the invalid provision or application of the Act which can be given effect without the invalid provision or application, and to this end the provisions of this Act are declared to be severable.

Comments to ARTICLE 6.

Article 6 contains general provisions prescribing administrative procedures and enforcement powers of the Bureau not specified elsewhere in the Act, civil and criminal liabilities, the effect of the Act on common law rights and liabilities and the traditional severance clause.

Provision for judicial review is omitted on the assumption that other state statutes adequately provide for it. Sections 6.201 and 6.205-6.208 elaborate on the judicial rights of action available to the state for compliance, damages and criminal penalties. Sections 6.202 and 6.203 specify the Bureau's power to order compliance with the Act and to engage in reclamation activities itself if the recipient of a compliancd order is unable or unwilling to comply, or if there are no responsible persons available. Section 6.204 grants the Bureau a right of entry to inspect and to engage in reclamation activities; this right extends both to the mined area and to other property where necessary to carry out activities on the mined area.

Section 6.301 is a response to the often litigated question of whether a scheme of public regulations abrogates existing private and public common law remedies relating to the same problem. Its answer is that there is no such pre-emption, thereby leaving in force remedies of nuisance, trespass and violation of riparian rights which may impose financial responsibility for the adverse environmental effects from mining operations.

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44. 1-2 U.S. Dep't. of Interior, Bureau of Mines, MINERALS YEARBOOK 1969, at 322-323 (1971). The annual Minerals Yearbooks are hereinafter cited by title and year.

45. Ibid.

46. For a survey of surface mining techniques, see SURFACE MINING AND OUR ENVIRONMENT, supra note 43, at 32.

47. See Table 2, at p. 26 in text.

48. Re airborne dusts, see: Folmar v. Elliot Coal Mining Company, Inc. 441 Pa. 592, 272 A.2d 910 (1971); Brown v. Turner Coal Co., Civ. No. 1542 (Cir. Ct. W.Va., filed Dec. 31, 1970), 1 E.L.R. Dig. 148.

49. National Coal Association, supra note 43, at 14.

50. 1-2 MINERALS YEARBOOK 1969, supra note 44, at 376. See also U.S. Army Corps of Engineers, supra note 42, at 19.

51. U.S. Army Corps of Engineers, supra note 42, at 17.

52. Ohio State University Research Foundation, ACID MINE DRAINAGE FORMATION AND ABATEMENT, Water Pollution Control Research Series 14010 FPR 04/71, Environmental Protection Agency, 44, 55, 68 (1971).

53. Also temperature and pH at the surface. See E. Smith and K. Shumate, Rate of Pyrite Oxidation and Acid Production Rate in the Field, Paper presented at the Acid Mine Drainage Workshop, Ohio University, Athens, Ohio, Aug. 2, 1971, at 2, 7.

54. W. Lorenz and R. Stephan, FACTORS THAT AFFECT THE FORMATION OF COAL MINE DRAINAGE POLLUTION IN APPALACHIA 47 (U.S. Dep't. of Interior, Bureau of Mines, Pittsburgh, 1967). This study is Attachment C to U.S. Army Corps of Engineers, supra note 42.

55. Ohio State University Research Foundation, supra note 52, at 33, 69.

56. SURFACE MINING AND OUR ENVIRONMENT, supra note 43, at 63.

57. See Ohio State University Research Foundation, supra note 52, at 1, 9, 10, 23, 24, 33. The authors of that study suggest as little as one or two centimeters may be a sufficient water shield.

58. Ibid. at 23, 58.

59. See ACID MINE DRAINAGE IN APPALACHIA, supra note 41, at 21; E. Smith and K. Shumate supra note 53, at 6-7.

60. ACID MINE DRAINAGE IN APPALACHIA, supra note 41, at 41-42.

61. Ohio State University Research Foundation, supra note 52 at 14, 21, 31.

62. ACID MINE DRAINAGE IN APPALACHIA, supra note 41, at 33.

63. ACID MINE DRAINAGE IN APPALACHIA, supra note 41, at 36.

64. U.S. Public Health Service, ACID MINE DRAINAGE, H.R. Comm. Print No. 18, Comm. on Public Works, 87th Cong., 2d Sess. 2 (1967); ACID MINE DRAINAGE IN APPALACHIA, supra note 41, at 33.

65. ACID MINE DRAINAGE IN APPALACHIA, supra note 41, at 27, 33; U.S. Army Corps of Engineers, supra note 42, at 10-11.

66. See ACID MINE DRAINAGE IN APPALACHIA, supra note 41 at 8-13, 67-110. For a detailed discussion of the effects of acid mine drainage, see the appendices to that report; in particular, Appendices A (THE IMPACT OF MINE DRAINAGE POLLUTION ON INDUSTRIAL WATER USERS IN APPALACHIA); D((THE IMPACTS OF MINE DRAINAGE POLLUTION ON LOCATION DECISION OF MANUFCATURING INDUSTRY IN APPALACHIA); E (IMPACT OF MINE DRAINAGE ON RECREATION AND STRESS ECOLOGY), and F (THE BIOLOGICAL AND ECOLOGICAL EFFECTS OF ACID MINE DRAINAGE).

67. The text in this subsection is based primarily on ENGINEERING ECONOMIC STUDY OF MINE DRAINAGE CONTROL TECHNIQUES (Cyrus Wm. Rice & Co.,Pittsburgh, 1969), which is Appendix B to ACID MINE DRAINAGE IN APPALACHIA, supra note 41.

68. The text in this subsection is based primarily on Ohio State University Research Foundation, supra note 52, at 57-73, and ENGINEERING ECONOMIC STUDY, supra note 67.

69. E. Smith and K. Shumate, supra note 53, at 2, 10.

70. See ENGINEERING ECONOMIC STUDY, supra note 67, at 74.

71. U.S. Army Corps of Engineers, supra note 42, at 12; see also ENGINEERING ECONOMIC STUDY, supra note 67 at 74.

72. ACID MINE DRAINAGE IN APPALACHIA, *supra* note 41, at 120.

73. ABATEMENT OF POLLUTION FROM ABANDONED MINES IN PENNSYLVANIA - A PROGRESS REPORT, March 1, 1970 at 2 (Pa. Dep't. of Health, Sanitary Water Board, Publication no. 26).

74. Gwin Engineers Inc., REPORT ON SLIPPERY ROCK CREEK MINE DRAINAGE POLLUTION ABATEMENT PROJECT (Commonwealth of Pennsylvania, Operation Scarlift) 10-15 (1970).

75. ACID MINE DRAINAGE IN APPALACHIA, *supra* note 41, at 116.

76. SURFACE MINING AND OUR ENVIRONMENT, *supra* note 43, at 64 (1967); S. Brock and D. Brooks, THE MYLES JOB MINE 37 (W.Va. Univ. Appalachian Center, Office of Research and Development, Research Series 1, Morgantown, 1968).

77. SURFACE MINING AND OUR ENVIRONMENT, *supra* note 43, at 54.

78. *Ibid*. at 63; *cf*. S. Brock and D. Brooks, *supra* note 76, at 37.

79. U.S. Dep't. of Agriculture, RESTORING SURFACE-MINED LAND, Publication No. 1082, in Hearings on Surface Mining Reclamation before the Senate Comm. on Interior and Insular Affairs, 90th Cong., 2d Sess. 77 (1968).

80. SURFACE MINING AND OUR ENVIRONMENT, *supra* note 43, at 54.

81. *Ibid*. at 64.

82. See ACID MINE DRAINAGE IN APPALACHIA, *supra* note 41, at 27; U.S. Army Corps of Engineers, *supra* note 42, at 18-19; S. Brock and D. Brooks, *supra* note 76, at 37-38; SURFACE MINING AND OUR ENVIRONMENT, *supra* note 43, at 54, 63, 64.

83. SURFACE MINING AND OUR ENVIRONMENT, supra note 43, at 54, 83. See W.Va. Code Ann. Sec.20-6-13 (Advance Copy 1971); Md. Bureau of Mines, Reg. No. 1, sec.1.10 (b)(3)(1970).

84. See S. Brock and D. Brooks, supra note 76, at 32, 36; SURFACE MINING AND OUR ENVIRONMENT, supra note 43 at 82.

85. SURFACE MINING AND OUR ENVIRONMENT, supra note 43, at 74, 82.

86. Ibid. at 56, 82.

87. U.S. Army Corps of Engineers, supra note 42, at 19.

88. SURFACE MINING AND OUR ENVIRONMENT, supra note 43, at 83.

89. Ibid. at 54.

90. Ibid. at 56.

91. See New York Times, Aug. 30, 1971, at 22, col. 1. Regarding strip mining in a state park, see Dep't. of Forests and Parks v. Georges Creek Coal and Land Co., 250 Md. 125, 242 A.2d 165 (1968), cert. denied, 393 U.S. 935 (1969).

92. S. Brock and D. Brooks, supra note 76, at 32.

93. Ibid. at 29-33.

94. Ibid. at 31.

95. Except as noted, this section on subsidence is based upon: W. Cochran, MINE SUBSIDENCE - EXTENT AND COST OF CONTROL IN A SELECTED AREA. (U.S. Dep't. of Interior, Bureau of Mines, Information Circular 8507, 1971); R. Fleming, SUBSIDENCE FROM A MINING ENGINEER'S POINT OF VIEW, which is Appendix A to REPORT OF THE SUBSIDENCE COMMITTEE, Pa. Gen. Ass., Legislative Journal, Appendix 4245, 4249 (1957); ENVIRONMENTAL EFFECTS OF UNDERGROUND MINING AND OF MINERAL PROCESSING

(unpublished report in U.S. Dep't. of Interior, Bureau of Mines; no date); see also. J. Zwartendyk, ECONOMIC ASPECTS OF SURFACE SUBSIDENCE RESULTING FROM UNDERGROUND MINERAL EXPLOITATION. (Ph.D. Thesis, Graduate School, Dep't. of Mineral Economics, Pennsylvania State University, March 1971).

96. W. Cochran, *supra* note 95, at 1, 24.

97. ENVIRONMENTAL EFFECTS, *supra* note 95, at 17, 71-72.

98. *Ibid*. at 53, 81-82.

99. W. Cochran, *supra* note 62, at 24.

100. *Ibid*. at 5, 15, 24.

101. *Ibid*. at 15.

102. Except as noted, the material in this section is based upon ENVIRONMENTAL EFFECTS, *supra* note 95, at 19, 20, 138-160, 170-171. See also SURFACE MINING AND OUR ENVIRONMENT, *supra* note 43, at 68-69.

103. See Commonwealth ex rel County of Allegheny v. Toth, 189 Pa. Super. 552, 152 A.2d 284 (1959).

104. Black's Law Dictionary 453 (West, St. Paul, 4th ed. 1951).

105. Appeal of Mathies Coal Co., 435 Pa. 129, 255 A.2d 906 (1969). Chandler v. French, 73 W.Va. 658, 81 S.E. 825 (1914).

106. *Cf*. Smith v. Glen Alden Coal Co., 347 Pa. 290, 32 A.2d 227,234 (1943).

107. R. Donley in 3 AMERICAN LAW OF MINING sec.16.1 (Mathew Bender, New York, 1970).

108. *Ibid*. See also P. Madeira, Jr., LEASES OF MINERALS AS ABSOLUTE SALES -- THE PENNSYLVANIA DOCTRINE, 74 U.Pa.L.Rev. 42, 61 (1915).

109. P. Madeira, Jr., supra note 108, at 61; R. Donley, THE LAW OF COAL, OIL AND GAS IN WEST VIRGINIA AND VIRGINIA sec.65a (Michie, Charlottesville, Va., 1951).

110. 3 AMERICAN LAW OF MINING, supra note 107, secs.16.36, 16.38-16.40.

111. R. Donley in 3 AMERICAN LAW OF MINING, supra note 107, sec.16.1.

112. Hummel v. McFadden, 395 Pa. 543, 150 A.2d 856, 860 (1959).

113. *Ibid*.

114. R. Donley, supra note 109, sec.109.

115. *Cf*. Bankers' Pocahontas Coal Co. v. Central Pocahontas Coal Co., 113 W. Va. 1, 166 S.E. 491 (1932); Babcock Coal & Coke Co. v. Brackens Creek Coal Land Co., 128 W.Va. 676, 37 S.E.2d 519 (1946).

116. Boron v. Smith, 380 Pa. 98, 110 A.2d 169 (1955); see also Smith v. Glen Alden Coal Co., 347 Pa. 290, 32 A.2d 227, 234 (1943).

117. See P. Madeira, Jr., supra note 108.

118. 3 AMERICAN LAW OF MINING, supra note 107, sec.16.16; Chandler v. French, 73 W.Va. 658, 81 S.E. 825 (1914); Hummel v. McFadden, 395 Pa. 543, 150 A.2d 856 (1959).

119. 73 W.Va. 658, 81 S.E. 825 (1914). On abandonment, see the cases collected in Annot., 60 A.L.R. 901, 926 (1929), supplemented in Annot., 76 A.L.R.2d 721, 743 (1961).

120. Gilberton Contracting Co. v. Hook, 255 F. Supp. 687 (E.D.Pa. 1966). Here, the refuse was silt from a breaker operation, deposited in layers by two different lessee operators. One operator was held to have abandoned the silt, having cast it away as worthless landfill. The other operator sold some of his, however,

and was held not to have abandoned it even after he gave up operation of the breaker and the surface was purchased by a third party. The sale reflected an intention not to abandon.

121. Cf. In re Appropriation of Easements for Highway Purposes, 174 Ohio St. 441, 190 N.E.2d 446 (1963). The owner of a hillside was held to own waste stone dumped from a quarry at the top of his land during operations which took place before he acquired the land. The stone was said to have become appurtenant to the land; therefore he was entitled to compensation for it in a condemnation action.

122. See Fisher v. West Virginia Coal & Transportation Co.,137 W.Va. 613, 73 S.E.2d 633 (1952); Moore v. Indian Camp Coal Co., 75 Ohio St. 493, 80 N.E. 6 (1907); Westerman v. Pennsylvania Salt Mfg. Co., 260 Pa. 140, 103 A. 539 (1918); Annot., 83 A.L.R.2d 665 (1962); USE OF THE SURFACE AND UNDERGROUND PASSAGES TO AID MINING OPERATIONS ON OTHER TRACTS OF LAND, 13 St.Louis U.L.J. 106 (1968). Cf. Tate v. United Fuel Gas Co., 137 W.Va. 272, 71 S.E.2d 65 (1952); Cramer v. Alberts, 395 Pa. 510, 150 A.2d 840 (1959).

123. See H. Caudill, supra note 29, at 70-76 (describing mineral acquisitions in eastern Kentucky).

124. For a discussion of the cloud on titles created by such exceptions and reservations, and a statute designed to meet the problem, see Love v. Lynchburg Nat'l Bank and Trust Co., 205 Va. 860, 140 S.E.2d 650 (1965).

125. Hester v. United States, 265 U.S. 57, 59 (1924).

126. Cf. Dunn v. County of Ramsey, -Minn.-, 184 N.W.2d 773 (1971) (local government liable for flooding caused by spoil dam created by road contractor without obtaining an easement, although the attempt to obtain one was made.

127. 113 Pa. 126, 6 A. at 453, 457 (1886).

128. McCune v. Pittsburgh & B. Coal Co., 238 Pa. 83, 85 A. 1102 (1913).

129. 281 Pa. 233, 126 A. 386, 391 (1924).

130. 79 Ohio St. 263, 87 N.E. 174, 176 (1909).

131. Black's Law Dictionary, *supra* note 104, at 1551.

132. 60 W.Va. 27, 53 S.E. 776, 777 (1906).

133. 180 Md. 395, 24 A.2d 788, 790 (1942).

134. Eidemiller v. Keystone Coal & Coke Co., 15 Pa. D & C 759 (1930); North-East Coal Co. v. Hayes, 244 Ky. 639, 51 S.W.2d 960 (1932). But see Pottstown Gas Co. v. Murphy, 39 Pa. 257 (1861).

135. Wheatly v. Baugh, 25 Pa. 528, 64 Am. Dec. 721 (1855); Pence v. Carney, 58 W.Va. 296, 52 S.E. 702 (1905); Sinclair Refining Co. v. Keister, 64 F.2d 537 (6th Cir. 1933) (Ohio law); Western Md. R.R. Co. v. Martin, 110 Md. 554, 73 A. 267 (1909) (dicta).

136. *Cf.* Gladfelter v. Walker, 40 Md. 1 (1874); Reserve Mining Co. v. Minnesota Pollution Control Agency 2 E.R.C. 1135 (Dist. Ct. Minn. 1970). A proffer by the defendant that he had employed the most modern techniques available in an effort to prevent surface water run off was rejected as a defense in Straight v. Hover, 79 Ohio St. 263, 87 N.E. 174 (1909); accord, Day v. Louisville Coal & Coke Co., 60 W.Va. 27, 53 S.E. 776 (1906).

137. 129 W.Va. 832, 42 S.E.2d 46, 48 (1947).

138. Franklin v. Cellicoat, 950 Ohio App. 345, 119 N.E.2d 688, 689-690 (1954).

139. 374 Pa. 262, 97 A.2d 825 (1953).

140. *Ibid.*, 97 A.2d at 827.

141. Stewart v. Chernicky, 439 Pa. 43, 266 A.2d 259, 261, 263 (1970).

142. Commonwealth v. Fitzmartin, 376 Pa. 390, 102 A.2d 893, 894 (1954).

143. 250 Md. 125, 242 A.2d 165, 166-167 (1968).

144. Ibid., 242 A.2d at 166-167.

145. See e.g., Mullan v. Hacker, 187 Md. 261, 49 A.2d 640 (1946).

146. Finley v. Teeter Stone, Inc., 251 Md. 428, 248 A.2d 106, 116 (1968); Lugin v. Dobson, 376 Pa. 620, 104 A.2d 95, 97 (1954); Harrison v. McOwen, 126 W.Va. 933, 30 S.E.2d 740 (1944); Ohio Collieries Co. v. Cocke, 107 Ohio St. 238, 140 N.E. 356, 361 (1923).

147. See Mullan v. Hacker, 187 Md. 261, 49 A.2d 640 (1946); Weaver v. Foundation Co., 310 Pa. 310, 165 A. 381 (1933); Ohio Collieries Co. v. Cocke 107 Ohio St. 238, 140 N.E. 356 (1923); Walker v. Strosnider, 67 W.Va. 39, 67 S.E. 1087 (1910).

148. Lugin v. Dobson, 376 Pa. 620, 104 A.2d 95 (1954); Winnings v. Wilpen Coal Co., 134 W.Va. 387, 59 S.E.2d 655 (1950).

149. Ohio Collieries Co. v. Cocke, 107 Ohio St. 238, 140 N.E. 356 (1923).

150. Piedmont & Georges Creek Coal Co. v. Kearney, 114 Md. 496, 79 A. 1013, 1015 (1911). RESTATEMENT OF TORTS, sec.819, Comment (f) (American Law Institute, St. Paul, Minn., 1939).

152. Bonaparte v. Wiseman, 89 Md. 12, 42 A. 918 (1899); Conrad v. Fleming, 89 Ohio App. 485, 102 N.E.2d 850, 851 (1951).

153. Beaver v. Hitchcock, 151 W.Va. 620, 153 S.E.2d 886 (1967); Leebov v. United States Fidelity and Guaranty Co., 401 Pa. 472, 166 A.2d 82, 85 (1960).

154. Ohio Rev. Code Ann. sec.723.49 (Page 1953); but compare Ohio Rev. Code Ann. sec.723.50 (Page 1953)

which allows excavations to the depth of the foundation of adjoining buildings even if greater than nine feet.

155. Noonan v. Pardee, 200 Pa. 474, 50 A. 255 (1901).

156. 37 Ohio App. 38, 170 N.E. 379, 381 (1929).

157. Piedmont & Georges Creek Coal Co. v. Kearney, 114 Md. 496, 79 A. 1013 (1911).

158. 266 Pa. 444, 109 A. 796 (1920).

159. Walker v. Strosnider, 67 W.Va. 39, 67 S.E. 1087, 1090 (1910).

160. Kuhn v. Carling, 196 Md. 318, 76 A.2d 345 (1950); RKO Midwest Corp. v. Berling, 51 Ohio App. 85, 199 N.E. 604 (1935); Langabaugh v. Anderson, 68 Ohio St. 131, 67 N.E. 286 (1903); Stewart v. Chernicky, 439 Pa. 43, 266 A.2d 259 (1970); Greek Catholic Congregation of Borough of Olyphant v. Plummer, 338 Pa. 373, 12 A.2d 435 (1940). As to liability of a lessor when a lessee removes surface support, see 3 AMERICAN LAW OF MINING, *supra* note 107, at sec.16.84

161. School District of Borough of Shenandoah v. City of Philadelphia, 367 Pa. 180, 79 A.2d 433 (1951), *cert. denied*, 342 U.S. 821 (1951). See also Greek Catholic Congregation of Borough of Olyphant v. Plummer, 338 Pa. 373, 12 A.2d 435 (1940); and Offerman v. Starr, 2 Pa. 394, 44 Am. Dec. 217 (1845).

162. O'Dell v. McKenzie, 150 W.Va. 346, 145 S.E.2d 388 (1965). *Cf*. Beuke v. Boggs Run Mining & Mfg. Co., 100 W.Va. 141, 130 S.E. 132 (1925); Reed v. Janutolo, 129 W.Va. 563, 42 S.E.2d 16 (1946).

163. Langabaugh v. Anderson, 68 Ohio St. 131, 67 N.E. 286 (1903) (dicta).

164. School District of Borough of Shenandoah v. City of Philadelphia, 367 Pa. 180, 79 A.2d 433 (1951), *cert. denied*, 342 U.S. 821 (1951).

165. 1959 Op. Att'y. Gen. (Ohio) 766, 768, construing Ohio Rev. Code Ann. sec.3767.02 (Page 1971).

166. See RESTATEMENT OF TORTS, supra note 151, sec.839 (liability of possessors); cf. RESTATEMENT (SECOND) OF TORTS sec.366 (American Law Institute, St. Paul, Minn., 1965). See also Hill v. Norton, 74 W.Va. 428, 82 S.E. 363 (1914) (lessor responsible after end of term for sidewalk defect created during term even though lessee renewed with defect in existence.)

167. Tankersley v. Peabody Coal Co., 31 Ill.2d 496, 202 N.E.2d 498 (1964), quoting Buis v. Peabody Coal Co., 41 Ill. App.2d 317, 190 N.E.2d 507, 510 (1963) (involving the same situation). Cf. O'Dell v. McKenzie, 150 W.Va. 346, 145 S.E.2d 388 (1965), discussed in the accompanying note 162. The defendant there was a lessor whose lessee had already abandoned the property, but the court did not rest liability on this fact.

168. RESTATEMENT OF TORTS, supra note 151, sec.820(g); Noonan v. Pardee, 200 Pa. 474, 50 A. 255 (1901) (relying on the statute of limitations, held to run from the time support was removed rather than the time injury occurred).

169. ACID MINE DRAINAGE IN APPALACHIA, supra note 41, at 6-7.

170. Ibid.

171. For an economist's view of the effectiveness of litigation as a resource allocation tool, see A. Kneese & B. Bower, MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS 84-88 (The Johns Hopkins Press, Baltimore, 1968).

172. For a general discussion, see N. Hines, NOR ANY DROP TO DRINK: PUBLIC REGULATION OF WATER QUALITY, Part I, State Pollution Control Programs, 52 Iowa L.Rev. 186 (1966).

173. Md. Ann. Code art. 96A, secs.24,26 (Supp.1971) (see

also, sec.106); Ohio Rev. Code Ann. secs.6111.01, 6111.04 (Page Supp. 1970); Pa. Stat. Ann. tit. 35, secs.691.11, 691.301, 691.315 (Supp. 1971); W.Va. Code Ann. secs.20-5A-2, 20-5A-5 (1970).

174. Act No. 394, sec.310, (1937) Pa. Laws 1987.

195. Act No. 177, sec.6, (1945) Pa. Laws 435.

176. See Sanitary Water Board v. Eckert, 71 Dauph. 288 (1959); Commonwealth ex rel Chidsey v. Black, 363 Pa. 231, 69 A.2d 376 (1949).

177. Act No. 194, sec.2,(1965) Pa. Laws 372.

178. Pa. Stat. Ann. tit. 35, sec.691.315(a) (Supp.1971).

179. Pa. Stat. Ann tit. 71, sec.510-1 (Supp.1971).

180. Pa. Stat. Ann. titl 35, sec.691.315(a) (Supp.1971); see also sec.691.601 et seq.

181. Sanitary Water Board v. Sunbeam Coal Corp., 91 Dauph. 70, 47 Pa. D. & C.2d 378 (1969).

182. Pa. Stat. Ann. tit. 35, sec.691.315(b) (Supp.1971).

183. Pa. Stat. Ann. tit. 35, sec.691.316 (Supp.1971).

184. Pa. Stat. Ann. tit. 35, sec.691.605 (Supp.1971).

185. Pa. Stat. Ann. tit. 35, sec.691.602 (Supp. 1971).

186. See Commonwealth ex rel County of Allegheny v. Toth, 189 Pa. Super. 552, 152 A.2d 284 (1959).

187. Md. Ann. Code art.96A, sec.26 (Supp. 1971); Ohio Rev. Code Ann. sec.6111.04 (Supp. 1970).

188. W.Va. Code Ann. Sec.20-5A-5(a) (1970).

189. W.Va. Code Ann. sec.20-5A-5(a)(2) (1970).

190. 51 Op. Att'y. Gen. (Md.) 164, 166 (1966).

191. Pa. Stat. Ann. tit. 32, sec.5116(a)(1)(II)(Supp.1971).

192. Pa. Stat. Ann. tit. 35, sec.691.8(b) (Supp. 1971).

193. Pa. Stat. Ann. tit. 52, sec.30.51 et seq. (Supp.1971).

194. Ch. 84, (1939) W.Va. Acts 402.

195. Ch. 16, (1947) Md. Laws, Ext. Sess.53; 122 Ohio Laws 730 (1947).

196. Maryland Coal and Realty Co. v. Bureau of Mines, 193 Md. 627, 69 A.2d 471 (1949).

197. Ch. 635, (1955) Md. Laws 1042.

198. Act No. 418, (1945) Pa. Laws 1198. Anthracite surface mining came under regulation in 1947; Pa. Stat. Ann. tit. 52, sec.681.1 et seq. (1966). A 1941 statute, still on the books, is directed at the safety of miners in all "coal stripping" operations; Pa. Stat. Ann. tit. 52, secs.1471-1476 (1966).

199. Act No. 529, (1949) Pa. Laws 1730; Act No. 377, (1953) Pa. Laws 1175; Act No. 521, (1956) Pa. Laws 1562; (1961) Pa. Laws 1210.

200. Act No. 133, (1963) Pa. Laws 239. The present law is codified as Pa. Stat. Ann. tit. 52, sec.1396.1 et seq. (1966 and Supp. 1971).

201. Pa. Stat. Ann. tit. 71, sec.510-1(5) (Supp. 1971).

202. W.Va. Code Ann. sec.20-6-16 (Advance copy 1971).

203. W.Va. Code Ann. sec.20-6-11 (Advance copy 1971).

204. W.Va. Code Ann. sec.26-6-11 (1970).

205. Md. Ann. Code art.66C, secs.548,574(b) (1970).

206. Md. Ann. Code art.66C, sec.665(d) (1970).

207. W.Va. Code Ann. sec.22-2-6 (1970).

208. Ohio Rev. Code Ann. sec.4153.40 (Page 1965).

209. Pa. Stat. Ann. tit. 52, sec.28.2 (Supp.1971).

210. Pa. Stat. Ann. tit. 52, secs.681.3,1396.3 (1966).

211. See W.Va. Code Ann. sec.20-6-12 (1970).

212. See Chapter IV of this study.

213. Pa. Stat.Ann. tit. 52, sec.28.5 (1966).

214. Pa. Stat.Ann. tit. 52, sec.28.7 (1966).

215. W.Va. Code Ann. sec.27-2-73 (1970).

216. W.Va. Code Ann. sec.20-5A-5(b) (1970).

217. Pa. Stat. Ann. tit. 52, sec.1406.1 _et seq_. (Supp.1971).

218. Pennsylvania Coal Co. v. Mahon, 260 U.S. 393 (1922), invalidating Pa. Stat. Ann., tit. 52, sec.661-670 (1966) dealing with subsidence over anthracite mines. The most recent anthracite subsidence statute is Pa. Stat. Ann. tit. 52, sec.672.1-672.10 (1966), adopted in 1961.

219. Pa. Stat. Ann. tit. 52, secs.1406.4-1406.6, 1406.10, 1406.15 (Supp. 1971).

220. Pa. Stat. Ann. tit. 52, sec.3201 _et seq_. (1966).

221. Pa. Stat. Ann. tit. 32, sec.5116(a)(1) (Supp.1971). Contributions to Pennsylvania of Federal funds on a matching basis "to fill voids in abandoned coal mines," _inter alia_, is authorized by 30.U.S.C. sec.571 (1970).

222. Pa. Stat. Ann. tit. 52, sec.30.203 (Supp. 1971). _Cf_. Pa. Stat. Ann. tit. 32, sec.5116(a)(1) (Supp.1971) which authorizes similar entry "pending the acquisition" of property required to combat air or water pollution, mine fires or subsidence.

223. 33 U.S.C. sec.1164(1970); 40 U.S.C. App.secs.205,302 (1970); 30 U.S.C. secs.551 et seq.,571 et seq. (1970).

224. Pa. Stat. Ann. tit. 32, sec.5101 et seq. (Supp. 1971). See Pa. Dep't. of Environmental Resources, BOND ISSUE REPORT FOR MONTH ENDING JUNE, 1971 (Harrisburg, 1971); also ABATEMENT OF POLLUTION FROM ABANDONED MINES IN PENNSYLVANIA, supra note 73.

225. Md. Ann. Code art. 66C, sec.674A et seq. (1970).

226. Hearings on Surface Mining Reclamation, supra note 79, at 67.

227. Md. Code Ann. art. 66C, sec.660 (1970), and art.96A, sec.106 (Supp. 1971).

228. See Goldblatt v. Town of Hempstead, 369 U.S. 590 (1962); Interim Zoning Ordinance, Garrett County, Maryland (May 10, 1971).

229. East Fairfield Coal Co. v. Miller, 71 Ohio L. Abs. 490, 505-506 (C.P. 1955); cf. East Fairfield Coal Co. v. Booth, 166 Ohio St. 379, 143 N.E.2d. 390 (1957).

230. W.Va. Code Ann. sec.20-6A-1 (Advance copy 1971).

231. See Act of July 11, 1940, ch. 581, 54 Stat. 752.

232. Pub. L. 91-575, 84 Stat. 1509 (1970).

233. See E. Cleary, THE ORSANCO STORY 167 et seq.(The Johns Hopkins Press, Baltimore, 1967); ORSANCO Resolution No. 5-60, January 14, 1960, as amended, January 10, 1963; ORSANCO Pollution Control Standard No. 1-70, adopted November 13, 1970.

234. Act of July 11, 1940, ch. 579, 54 Stat. 748, as amended, Pub. L. 91-407, 84 Stat. 856 (1970).

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252. Midland Electric Coal Corp. v. Knox County, 1 Ill.2d 200, 115 N.E.2d 275, 283 (1953).

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311. Basehore v. Hampden Industrial Development Auth. 433 Pa. 40, 248 A.2d 212 (1968).

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333. MINERALS YEARBOOK, supra note 44, for each year in the period mentioned.

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341. D. Brooks, STRIP MINE RECLAMATION AND ECONOMIC ANALYSIS, 6 Nat. Res. J. 13, 17 (1966).

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344. Appendix B, ENGINEERING ECONOMIC STUDY, supra note 67, at 140. (Figures adjusted to account for inflation at 5% annually.)

345. U.S. Bureau of the Census, supra note 339.

GLOSSARY OF LEGAL TERMS

ABANDONMENT - the voluntary giving up of property or rights.

ACCESSION - principle whereby an owner of property becomes entitled to something which is added or united to it.

ASSESSMENT - imposition of pecuniary payment upon person or property.

CONDEMNATION - process through which property of a private owner is expropriated by a governmental agency, without the private owners consent, but upon payment of compensation.

CONVEYANCE - transfer of land from one person to another.

DEED - a written instrument conveying real property.

EASEMENT - a right of one person to use the land of another for some special purpose.

EMINENT DOMAIN - condemnation.

ESTATE - the interest which a person has in property.

FEE SIMPLE DETERMINABLE - a fee simple estate which will terminate on the occurrence of a specified condition.

FEE SIMPLE ESTATE - the most extensive interest a man can have in land.

LICENSE - permission of one person to go or act on land of another.

LIEN - a charge of incumbrance.

LIMITATION - the time at the end of which no legal action can be maintained.

NEGLIGENCE - legal doctrine imposing civil responsibility upon a finding that a man failed to exercise

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reasonable care under the circumstances.

NUISANCE - unlawful conduct which annoys and disturbs another in possession of his property.

PERSONAL PROPERTY - generally everything that is subject of ownership not coming under the denomination of real property, including commodities.

POLICE POWER - regulatory power which inheres in state government

POSSIBILITY OF REVERTER - the right to obtain property upon the occurrence of the condition which terminates a fee simple determinable estate.

PROFIT - a right of one man to excavate soil or minerals owned by another.

REAL PROPERTY - land, and generally whatever is erected upon or affixed to land.

RECORDING - process through which the public is given notice of conveyance of, and the imposition of liens on, real property.

RIPARIAN RIGHTS - the rights of owners of lands abutting on the banks of streams.

ROYALTY - a payment reserved by the grantor of a lease on a mine or similar right, and payable proportionally to the amount of mineral extracted by the grantee.

WAIVER - legal doctrine which extinguishes rights upon a finding that the holder has intentionally relinquished them.

ZONING - land use control prescribing the use to which various designated districts may be put.

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16. Abstract

Coal mining produces a variety of environmental problems -- acid drainage, sedimentation, surface subsidence and surface scars. This study reviews the response of legal institutions to these problems in Maryland, Ohio, Pennsylvania and West Virginia. Technological and economic concerns are also taken into account.

The study discusses the antecedents of today's Appalachian coal industry and the environmental problems it has created. It examines the way in which the property system allocates rights in coal and coal lands, the efficacy of litigation and present laws and regulations for preventing environmental damage, and constitutional limitations on the ability of states to effectively respond to the problems. A case study of the economics of the Maryland coal industry is also presented. Model legislation giving the states the necessary powers to respond to environmental problems, is proposed.

17a. Descriptors *Coal mine wastes, *Reclamation, *Legal aspects, Acid mine waters, Land subsidence, Sediments, Strip mines, Underground, Mining Administrative decisions, Eminent domain, Interstate compacts, Judicial decisions, Permits, Riparian rights, Third party effects, Water law, Water rights

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